Benha University
Faculty of Engineering at Shoubra

RULES, REGULATIONS, STUDY PLANS & COURSES DESCRIPTION FOR UNDERGRADUATE PROGRAMS AT FACULTY OF ENINEERING (SHOUBRA) (TWO-SEMESTER SYSTEM)

2021

CONTENTS

INTRODUCTION

The necessity of renewing the academic programs has become imperative in order to keep pace with the international developments of engineering sciences to graduate engineers with a high degree of professional competences and to keep pace with the latest international technologies. Therefore, in the preparation of these regulations the development in the engineering fields have been considered. The potentials of the faculty have been developed and utilized to meet the requirements of a graduate that can compete on local, regional and international levels.

The following requirements have been observed:

1. Redesigning the existing academic programs by introducing new courses to keep pace with the scientific development in recent years, in addition to updating the scientific content of the previous courses in all academic programs.
2. The development of a new program, typically, “Mechatronics Engineering Program” belonging to the Mechanical Engineering Department.
3. Changing the name of the “Survey Engineering” program to the "Geomatics Engineering" and also the name of the Department was changed.
4. The title of "Engineering Mathematics and Physics Department” was changed to a broader name, typically, "Basic Engineering Sciences Department”.
5. The contact hours for students is reduced in order not to exceed 25 hours per week and the number of courses taken is not to exceed 6 courses per semester.
6. The possibility of adapting some online e-courses.
7. Focusing on enabling the student to acquire different skills in technical writing , presentation, communication and computer applications .
8. Activating the role of academic advising.
9. Focusing on practical and field training to provide students with skills required by the labor market.
10. The teaching language in the faculty in all academic programs and courses is English as a primary language. In addition, Arabic language may be used as a teaching language in some courses according to course requirements. This provides opportunities for regional and international competition for graduates.

Finally, it should be noted that the present regulations have been prepared according to the reference framework for the preparation of undergraduate programs in the faculties of engineering based on the two-semester system issued by the Committee of Engineering, Technological and Industrial Studies Sector at the Supreme Council of Universities on March 7, 2020. The academic programs consider the National Academic Standards (NARS) - Version 2018.

PART I
FACULTY VISION, MISSION AND GOALS

ARTICLE (1): FACULTY VISION

The Faculty of Engineering at Shoubra, Benha University, aspires to be a leading college at the national, regional and international level in the fields of engineering education, scientific research innovation and entrepreneurship in order to achieve the sustainable development goals.

ARTICLE (2): FACULTY MISSION

The Faculty of Engineering at Shoubra is committed to prepare a graduate with competencies and problem-solving skills that qualify each engineer to compete in local and regional labor markets, the graduate will be able to innovate and become an entrepreneur, the faculty is also committed to the development of engineering sciences and producing internationally distinguished scientific research, within the framework of human values and social responsibility.

ARTICLE (3): FACULTY GOALS

The Faculty of Engineering at Shoubra aims to graduate engineers in various specialization so that they are able to promote the rapid development of our beloved Egypt through the following goals:

(1) Providing a distinguished educational service, according to advanced learning strategies, and within the framework of commitment to the ethics and rules of the profession, in order to develop students' individual and collective work potential, which supports their capabilities for innovation and entrepreneurship.
(2) Preparing students for a successful professional future by providing them with the analytical, experimental and computer tools and means necessary to identify and formulate engineering problems and develop plans for a solution according to high technical specifications, taking into account the ethical aspects and societal responsibility.
(3) Providing students with the basics of engineering sciences necessary to keep pace with the continuous development in the various engineering fields to become qualified to design, develop, maintain and manage many systems in those fields.
(4) Providing an effective source of qualified engineering expertise in line with the needs of the labor market and the accompanying development through training

and providing advice to governmental and industrial bodies in the local and international community.

(5) Upgrading the system of graduate studies and scientific research so that the faculty offers new solutions to improve the standard of life and contribute to advancing economic development and developing the surrounding environment.

(6) Providing students with the necessary skills to communicate and work with others as a team in order to assume responsibility and learn for life, which enables them to join freelance work or pursue postgraduate studies in the engineering field.

PART II
FACULTY DEPARTMENTS AND ACADEMIC PROGRAMS

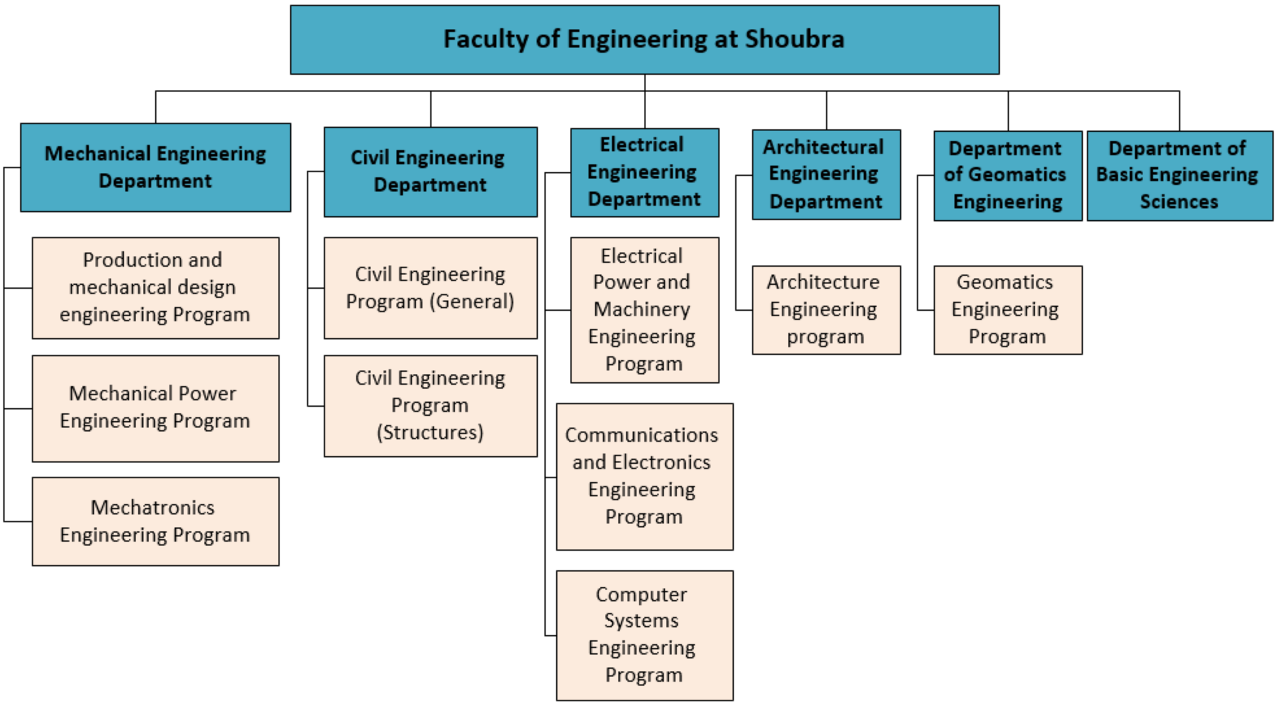
ARTICLE (4): Departments and Academic Programs (Two-Semester System)

1- Department of Basic Engineering Sciences.
2- Mechanical Engineering Department.
   It contains the following academic programs:
   - Mechanical Power Engineering Program.
   - Mechanical Design and Production Engineering Program.
   - Mechatronics Engineering Program (Mechanical Systems Engineering)
3- Electrical Engineering Department.
   It contains the following academic programs:
   - Electrical Power and Machines Engineering Program.
   - Communications and Electronics Engineering Program.
   - Computer Systems Engineering Program.
4- Department of Civil Engineering.
   It contains the following academic programs:
   - Civil Engineering Program (General).
   - Civil Engineering Program (Structures).
5- Architectural Engineering Department
   It contains an academic program which is:
   - Architecture Engineering program.
6- Department of Geomatics Engineering.
   It contains an academic program which is:
   - Geomatics Engineering Program.

There are also five credit hours programs (programs with tuition fees) and are not covered by the present regulations:

1- Industrial Engineering.
2- Energy and Sustainable Energy Engineering.
3- Electrical Engineering and Control.
4- Communications and Computer Engineering.
5- Construction Sites Engineering and Management.

The following figure shows the departments of the faculty and its programs in the two-semester system.



ARTICLE (5): Bachelor's Degrees

Benha University grants, upon the request of the Council of the Faculty of Engineering at Shoubra, the Bachelor of Science (B.Sc.) degree in one of the following engineering disciplines (Two-semester system):-

1- Mechanical Engineering (mechanical power engineering).
2- Mechanical Engineering (mechanical design and production engineering).
3- Mechanical Engineering (mechatronics engineering).
4- Civil Engineering (general).
5- Civil Engineering (structures).
7- Electrical Engineering (electrical power and machines engineering).
8- Electrical Engineering (communications and electronics engineering).
9- Electrical Engineering (computer systems engineering).
10- Architecture Engineering.
11- Geomatics Engineering.

This is in addition to the Bachelor of Science (B.Sc.) degree in one of the following engineering disciplines (Credit-Hours system):-

1- Industrial Engineering.
2- Energy and Sustainable Energy Engineering.
3- Electrical Engineering and Control.
4- Communications and Computer Engineering.
5- Construction Sites Engineering and Management.

III
GENERAL ACADEMIC REGULATIONS & RULES

ARTICLE (6): Study System

- The faculty of engineering at Shoubra adopts the two-semester system and the duration of study for a bachelor's degree is four academic years preceded by a preparatory year (a total of five academic years).
- The teaching language within academic programs as well as exams will be in English as a primary language in addition to Arabic in some courses according to course requirements

ARTICLE (7): Study Dates and Duration

The academic year is divided into two semesters as follows:

- First semester (fall-semester): starts at the beginning of the second week of September for a period of 15 weeks.
- Second semester (spring-semester): starts at the beginning of the second week of February for a period of 15 weeks.

ARTICLE (8): Enrollment Requirements

Admitted students should have acquired the general secondary education certificate (mathematics section), or equivalent certificates according to the requirements of the Supreme Council of Egyptian Universities. Students are allocated through the office of coordination or may be transferred from other faculties according to the regulations approved by the Supreme Council.

ARTICLE (9): Distribution of Students to Scientific Departments and Academic Programs

Students, after completion of the preparatory, are distributed to the different departments according to the system determined by the faculty. At the end of each academic year, the faculty Council determines the number of students who are allowed to continue their studies in each department. The department council may also make an internal distribution system to distribute students to its programs.

ARTICLE (10): Academic Advising

The head of the relevant department council assigns an academic advisor from among the faculty members for each student or group of students that have enrolled in the program . The academic advisor may continue advising students till completion of their program, monitoring their performance during the educational process. The Academic Advisor shall undertake the following tasks:

1. Introduce students to all the rules and regulations of the program, especially the new students and confirm their understanding of these regulations.
2. Introduce students to program updates.
3. Assists students in choosing elective courses.
4. Follow-up the progress of students during the semester.
5. Resolving problems of students during their studies in coordination with the department.
6. Provide academic advice and assistance to students to raise their academic standards.

ARTICLE (11): Genera Courses (University Requirements)

The Faculty Council entrusts the Vice Dean for Education and Student Affairs (in coordination with the concerned departments) to assign one or more departments of the faculty and / or university to teach the general courses (university requirements) with code (GEN) according to the detailed schedules of the courses in the scientific departments and academic programs.

ARTICLE (12): Transfer of Students to a Higher Level

A student is transferred from his present level to the higher level if he succeeds in all courses or if he fails in no more than two core courses, two general courses (humanitarian) or field training of his present level and / or a lower level.

ARTICLE (13): Conditions of Success in a Course

- To successfully complete a course, a student must have scored at least 50% of its total grades in the course and at least 40% of the final written exam scores.
- In case the student scores more than 50% of the total course grades and does not get 40% of the score of the final written exam, the student is considered as failed the course and the result is noted in the student’s transcript as (Bylaw fail, BL).
- The student is considered as failed if he/she was denied attending the written examination at the end of the semester due to exceeding the rate of absenteeism or cheating, etc., or due to the student not attending the final exam without an excuse accepted by the faculty.

ARTICLE (14): Grades

- Grades of courses (or accumulated grades) are calculated according to the following table:-

Percentage (%)	Grade
Less than 50%	Fail
From 50% to 65%	Pass
From 65% to 75%	Good
From 75% to 85%	Very Good
From 85% and higher	Excellent

- The following table shows the equivalence of the grades for the conversion from the two-semester system to the credit hour system (according to the terms of reference for the credit hour system for the bachelor degree programs issued by the Supreme Council of Universities, which was approved at the session of the Engineering Studies Sector Committee No. 15 on 16 May 2013):

Two-Semester System	Credit Hours System	
Percentage (%)	Equivalent Grade	Points
From 95% to 100%	A+	4.00
From 90% to less than 95%	A	4.00
From 85% to less than 90%	A-	3.70
From 80% to less than 85%	B+	3.30
From 75% to less than 80%	B	3.00
From 71% to less than 75%	B-	2.70
From 68% to less than 71%	C+	2.30
From 65% to less than 68%	C	2.00
From 60% to less than 65%	C-	1.70
From 55% to less than 60%	D+	1.30
From 50% to less than 55%	D	1.00
Less than 50%	F	0.00

ARTICLE (15): Attendance

The student must attend lectures and practical lessons and is prohibited from attending the final exam of a course if her/his attendance rate is less than (75%) of the exercises and practical lessons assigned to the course during the semester. This must be based on a report of the course teacher, the agreement of the related Scientific Department Council, the consultation of the Committee of Education and Student Affairs and the approval of the Faculty Council. In this case, the student is considered as failed the course and consumed one of the chances of entering the exam in this course. The Faculty Council may waive the prohibition and allow the student to attend the final exam if he/she submits an acceptable excuse.

ARTICLE (16): Examination Dates

- Exams are held at the end of each semester (January - May) in the courses studied by the student in his level.
- Re-examination of students who failed up to two courses in their final examinations shall be held in (January - May - September) subject to the following conditions:-
    - The students are transferred to a higher level but failed in not more than two courses at the end of the academic year.
    - Final level students who failed or were absent with or without an excuse in one or two courses not including the graduation project for which there is no re-examination.
    - The student that fails the graduation project remains a failed student to repeat his project. If the student has failed in courses in addition of the project, he/she will perform the repetition exams in the same periods as stated before in the next year.

ARTICLE (17): Re-Examination

In order to pass a course, the student must obtain at least 50% of his/her total grades in the course and at least 40% of the final written exam scores. In this case, the student is considered to have a “pass” grade and shall not have more than its maximum score even if his score exceeded it.

ARTICLE (18): Postponement and Interruption of Studies

- The student may apply to postpone his study for a semester giving an excuse accepted by the Faculty Council provided that the duration of the postponement does not exceed two successive semesters or a maximum of three separate semesters as a condition for continuing his studies at the university otherwise his enrollment will be cancelled thereafter. The period of postponement shall not be taken into account as part of the period required to complete the graduation requirements.

- The dismissed student can apply for re-enrollment, retaining the same academic record before dismissal, according to the following conditions:
  - Applying for re-enrollment within four semesters from the date of dismissal.
  - The faculty and university councils must agree to re-enroll the student.
  - The student cannot be re-enrolled more than once. The university council may make exceptions when necessary.

ARTICLE (19): Summer Training

- Students must attend practical training in the summer period as shown in the schedules of departments for different programs. Training is carried out under the supervision of the related department. The score of summer training is added to the scores of the courses listed in the program level tables.
- The Council of the scientific department determines the dates and the system of practical summer training.
- Students are divided in summer training into groups of 15 students each. A teacher and an assistant (or a practical trainer) are assigned to train the group.
- The Council of the Departments and the College Council approve the teaching plan for summer training and all teaching hours in the summer period are calculated in excess of the quorum.
- The summer training marks are divided as follows: 60% of the total marks is for the class exercises, home exercise, projects …etc, and 40% of the total marks is for the training report and oral exam at the end of the training period.

ARTICLE (20): Field Training

- Students must attend two field trainings in the summer period in factories, companies or organizations related to their field before joining the next level as shown in the schedules of their departments and programs, under the supervision of the related department.
- At the end of the training, the student must submit a detailed report and the student is to be examined (oral examination) by an examination committee that is approved by the relevant department consisting of three faculty members in addition to one representative of the industry or organization (if possible).
- The Council of the scientific department determines the dates and system of field training and the dates of oral examination.

- The student shall not be considered to have passed the field training until after obtaining at least 50% of the score prescribed for training. The grade achieved in field training is mentioned in the academic record of the student in the case of passing and is mentioned as fail in the case of failure.
- The graduation certificate shall be granted only to students who have successfully completed the field trainings. Students who fail to attend the training may be allowed to attend it on any subsequent summer holiday during the study period.
- The Council of the Scientific Department and the Council of the Faculty approve the supervisory plan and committees set up for oral examinations related to field training. All supervisory hours and discussions in the summer period are calculated in excess of the quorum.

ARTICLE (21): Graduation Project

- Final year students are required to prepare a graduation project. The councils of the concerned scientific departments shall determine its subjects and allocate an additional period after the written examinations (maximum of six weeks) according to the schedules of courses in the study plans of the programs of the present regulation and the project will be discussed at the end of the specified period.
- In case of failure of the student in the graduation project he remains to repeat even if he succeeded in all other courses.
- The student who did not attend the discussion of the project is considered as failed
- The project scores are distributed according to the schedules of the courses in the study plans of the programs.

ARTICLE (22): Scientific Trips

The faculty organizes local and international scientific trips for students under the supervision of the faculty members in accordance with the system determined by the faculty.

ARTICLE (23): Online E-Courses

The Faculty Council, after taking the opinion of the relevant department council and according to the nature of the curricula, may approve the availability of teaching one or more courses in the hybrid education mode, or to conduct examinations electronically in one or more courses, whether in the whole course or part of it, in a way that allows it to be corrected electronically provided that it is presented to the Council of Education Affairs And students at the university for approval and submitted to the University Council for approval.

ARTICLE (24): Honors Degree

Benha University grants honors to a student whose grade is not less than “Very Good” with this grade being achieved at least in all academic years during his study in the program (with the exception of the preparatory year). In order to grant honors, the student must not have received a "failed" grade in any course during his university studies.

ARTICLE (25): Transferring the Students from Credit Hours System to Two-Semester System

- A student who is enrolled in the college by credit hours may be transferred to the two-semester system subject to satisfying the following conditions:-
  - Completion of at least two basic consecutive semesters in the credit hours system program.
  - The student should not have completed 60% of the total credit hours required for graduation in the credit hours system program.
- A student may not be transferred from the credit hours system to the two-semester system if he does not meet the admission requirements for the two-semester system at the time of enrolling in the faculty (Article #8 of these regulations).
- The courses passed by the student in the credit hours system are considered for clearing the equivalent courses, specified in the program to which the student is transferred, by the relevant scientific department.
- The following table shows the equivalence of the grades for the conversion from the credit hours system to the two-semester system (according to the terms of reference for the credit hour system for the bachelor degree programs issued by the Supreme Council of Universities, which was approved at the session of the Engineering Studies Sector Committee No. 15 on 16 May 2013):

Credit Hours System		Two-Semester System
Grade	**Points**	**Percentage (%)**
A+	4.00	98%
A	4.00	93%
A-	3.70	88%
B+	3.30	83%
B	3.00	78%
B-	2.70	73%
C+	2.30	70%
C	2.00	67%
C-	1.70	63%
D+	1.30	58%
D	1.00	53%
F	0.00	-

ARTICLE (26): Dismissal from the Faculty

- It is not permissible for the student to remain in the preparatory year for more than two years and is considered dismissed if he/she exceeds the two years of failure.
- The student may not stay in the first year for more than two years. The Faculty Council may allow students who have spent two years in the first year and failed to apply for being examined, as external students, in the following year in the courses that they failed for only one chance. The student is dismissed after he/she has exhausted all the allowed opportunities both as an internal (enrolled) and external student.
- The student may not stay in the second, third or final year for more than two years. The Faculty Council may allow failed students three additional chances to apply for being examined, as external students. The student is considered to be dismissed after he/she has exhausted all the allowed opportunities both as an internal (enrolled) and external student.

ARTICLE (27): Student Activities

- Benha University encourages students to participate in all student activities (athletic, artistic, scientific, literary, ... etc.) and student competitions, whether local or international. Such activities are supported by the university and the faculty.

- Alternative assessment midterm and oral exams may be arranged for students representing their faculty or the university by participating in activities or competitions after approval of the relevant department council. Accordingly, those students were unable to attend their scheduled exams as a result of such participation. Submission of proof of participation is required.
- If the student is unable to attend a final written examination for one or more subjects as a result of his participation in an international or local student activity after approval of the faculty or university, the student shall be considered absent with an excuse and shall retain his grades in the courses upon repeating the exam.

ARTICLE (28): Summary of total data about programs

#	Engineering Program	NC	Credits and SWL			Total Contact Hours				Requirements %				BS %
			CH	ECTS	SWL	Lec	Tut	Lab	TT	UR	FR	DR	PR	
1	Mechanical Power	60	151	30	750	96	88	66	250	8	28	39.2	24.8	25.6
2	Mechanical Design & Production	60	151	30	750	96	84	70	250	8	28	39.2	24.8	25.6
3	mechatronics	60	149	30	750	95	78	77	250	8	28	37.6	26.4	25.6
4	Electrical Power & Machines	60	153	30	750	106	77	67	250	8	28	38	26	25.6
5	Communications & Electronics	60	157	30	750	105	57	88	250	8	28	37	27	26
6	Computer Systems	60	157	30	750	105	57	88	250	8	28	37	27	26
7	Civil - General	60	158	30	750	106	93	51	250	8	28	39	25	25.2
8	Civil - Structures	60	157	30	750	106	91	53	250	8	28	34.4	29.6	25.2
9	Geomatics	60	158	30	750	103	82	65	250	8	28	40	24	25.6
10	Architecture	60	156	30	750	81	144	25	250	8	28	38.4	25.6	20

Where:

NC	Total number of Courses without summer and field trainings	**TT**	Total contact hours
CH	Credit Hour	**UR**	University Requirement
ECTS	European Credit Transfer System	**FR**	Faculty Requirement
SWL	Student Workload	**DR**	Discipline Requirement
Lec	Lectures	**PR**	Program Requirement
Tut	Tutorials	**BS**	Basic Sciences percentage
Lab	Laboratory		

ARTICLE (29): Financial Rules

In accordance with the present regulations, the financial rules related to teaching, supervising summer training, field training and hours outside the quorum, shall be determined in accordance with the financial rules approved by the University Council in this regard.

ARTICLE (30): Additional Rules

- The University Council, after the College Council, shall be presented with all subjects for which no provision is made in the articles of this regulation.
- Regarding issues that have not been mentioned in the present regulation, the regulations sited in the Universities Organization Law No. 49 of 1972 and its Executive Regulations with the latest issued amendments, shall be applied.

CODING SYSTEM OF COURSES

PART IV
CODING SYSTEM OF COURSES

Each course is identified by its own course code with letters and numbers.

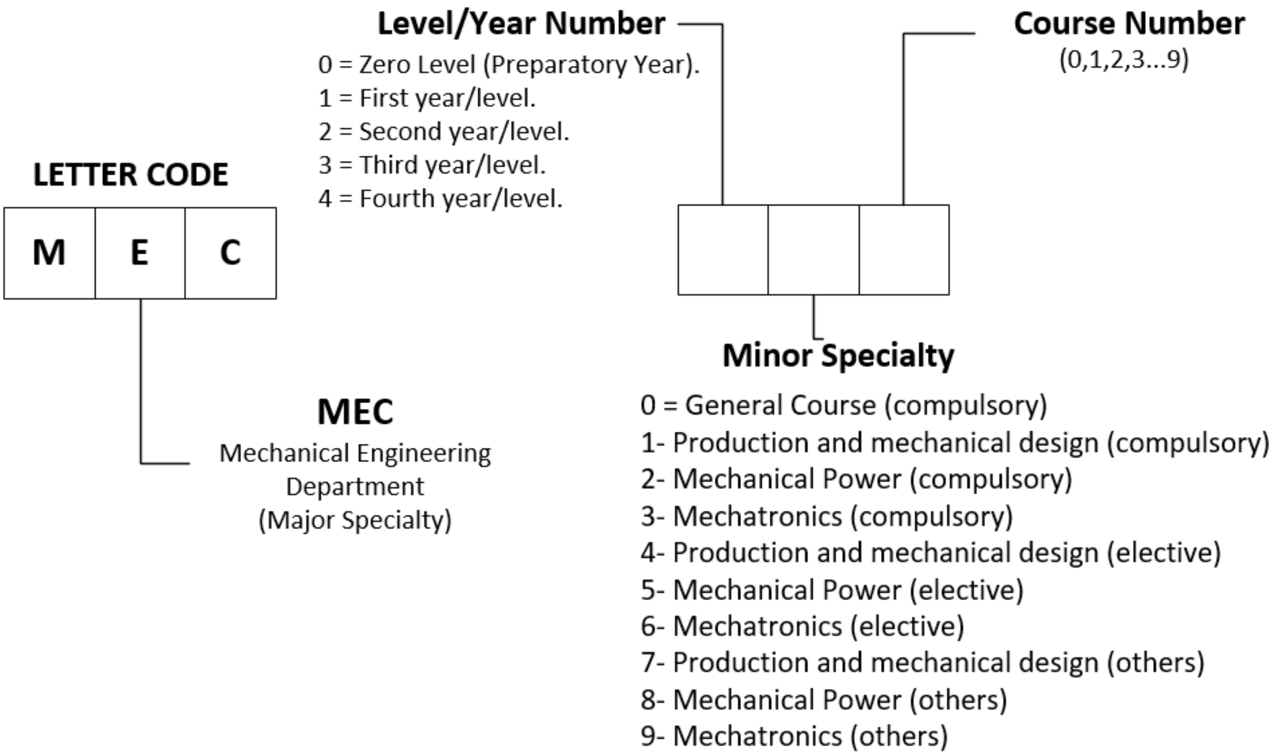
Letter Code:
This is the first half of the course code consisting of three letters that represent the department or the major engineering field at which the course belongs. The Table below shows the letter coding.

Number Code:
This is the second half of the course code which consists of a number with three digits.

- The first digit of the number code signifies the level for which the course is intended (Levels from 0 to 4).
- The second digit represents the program/minor specialty at which the course belongs, and it is listed in the following table.
- The third digits are assigned to courses in sequence number order.

#	Department/Major Specialty	Letter Code	Program/Minor Specialty	2nd Digit Code
1	Basic Engineering Sciences	BAS	---	0,1
2	Geomatics Engineering	GED		0,1
3	Mechanical Engineering	MEC	General	0
			Mechanical Design and Production	1,4,7
			Mechanical Power	2,5,8
			Mechatronics	3,6,9
4	Civil Engineering	CIV	Civil Engineering (General)	1,3,5
			Civil Engineering (Structures)	2,4,6
5	Electrical Engineering	ELE	General	0
			Electrical Power and Machines	1,4,8
			Communications and Electronics	2,5,9
			Computer Systems	3,6,9
6	Architectural Engineering	ARC	Architectural Engineering	1,2
7	General Courses	GEN	---	0,1

Example:


Level/Year Number
0 = Zero Level (Preparatory Year).
1 = First year/level.
2 = Second year/level.
3 = Third year/level.
4 = Fourth year/level.
Course Number
(0,1,2,3...9)
LETTER CODE
M
E
C
MEC
Mechanical Engineering
Department
(Major Specialty)
Minor Specialty
0 = General Course (compulsory)
1- Production and mechanical design (compulsory)
2- Mechanical Power (compulsory)
3- Mechatronics (compulsory)
4- Production and mechanical design (elective)
5- Mechanical Power (elective)
6- Mechatronics (elective)
7- Production and mechanical design (others)
8- Mechanical Power (others)
9- Mechatronics (others)

PART V
Study Plans and Courses Description

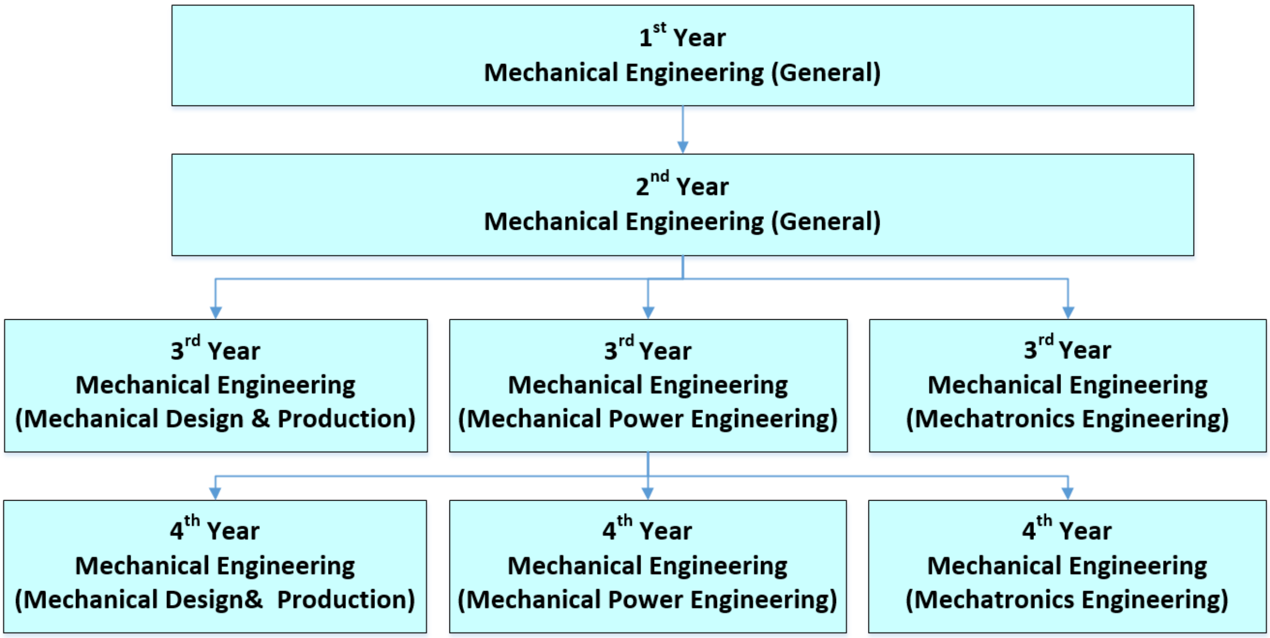
STUDY PLANS FOR MECHANICAL ENGINEERING DEPARTMENT PROGRAMS

MECHANICAL ENGINEERING DEPERTMENT
UNDERGRADUATE PROGRAMS

The Mechanical Engineering Department contains three academic undergraduate programs as follows-:

1- Mechanical power engineering program.
2- Mechanical design and production engineering program.
3- Mechatronics engineering program (mechanical systems engineering).

The first and second year are common for all programs. The following diagram shows a general layout of the department: -



MECHANICAL POWER ENGINEERING PROGRAM

Program Information

MECHANICAL POWER ENGINEERING PROGRAM

1. Faculty vision:

The faculty of Engineering at Shoubra, Benha University, aspires to be a pioneering college at the national, regional and international levels in the fields of engineering education, scientific research, innovation and entrepreneurship in order to achieve the goals of sustainable development.

2. Faculty Mission:

The faculty of Engineering at Shoubra is committed to prepare a graduate with competencies and problem-solving skills [1] that qualify each engineer to compete in local and regional labor markets [2], the graduate will be able to innovate and become an entrepreneur [3], the faculty is also committed to the development of engineering sciences [4] and producing internationally distinguished scientific research [5], within the framework of human values and social responsibility [6].

3. Program Vision:

Mechanical Power Engineering Program, faculty of Engineering at Shoubra, aspires to be a pioneering program in education and scientific research in the fields of Mechanical power engineering at the regional and international levels and to provide an outstanding community service to the community and the surrounding environment.

4. Program Mission:

The Mechanical Power Engineering program is committed to graduating engineers who are able to understand the continuous development in scientific technologies and competition at the local and regional levels, equipped with basic and applied science foundations, able to produce innovative solutions to the needs of all sectors of society in the fields of mechanical power engineering, and are aware of the ethical and professional values and requirements of environmental protection. In addition to developing research and scientific studies and upgrading their quality in line with the needs of society.

To judge the compatibility between the program mission and faculty mission, the following matrix is used.

Key Words of Faculty Mission / Key Words of Program Mission	Prepare a graduate with competencies and problem-solving skills [1]	Compete in local and regional labor markets [2]	Innovate and become an entrepreneur [3]	Development of engineering sciences [4]	Producing internationally distinguished scientific research [5]	Human values and social responsibility [6].
Preparing a graduate equipped with knowledge and skills	√			√	√	
Compete in local and regional labor markets		√				
Innovate and become an entrepreneur			√			
Distinguished community participation	√			√	√	√
Human and moral values						√
Produce scientific research				√	√	√

5. Program Objectives:

The mechanical design and production engineering program aims to:

1. Apply and integrate knowledge and understanding of mathematics, physics, engineering sciences and skills to solve engineering problems in various topics and computer programs available to solve real problems in industries, heating, ventilation and air conditioning systems, and power plants to meet the required needs within realistic constraints.
2. Identify, formulate, and solve basic engineering problems and use appropriate engineering techniques, skills and tools necessary for engineering practice and project management.
3. Evaluating the sustainability and environmental issues related to mechanical energy systems and considering the impact of engineering solutions on society and the environment.
4. Use energy efficiently, demonstrate knowledge of contemporary engineering issues, and engage in self-learning and lifelong learning.
5. Apply industrial security, display professional and ethical responsibilities, understand context, and communicate effectively
6. Work effectively within multi-disciplinary engineering teams and lead or supervise a group of engineers, technicians, and workforce.
7. Design, operation and maintenance of fluid and energy transmission systems, heating, ventilation and air conditioning systems, internal combustion engines and steam engines, verifying their performance and solving their basic operational problems.

To judge the compatibility of program mission with its objectives, the following matrix is used:

Key Words of Program Mission / Program Objectives	Prepare a graduate with competencies and problem-solving skills	Competition in regional labor markets	Produce scientific research	Distinguished community participation	Human and moral values
Objective #1	√		√		
Objective #2	√		√		
Objective #3	√	√		√	√
Objective #4	√	√			
Objective #5					√
Objective #6	√			√	√
Objective #7	√		√		

6. Graduate Attributes:

1. Master a wide spectrum of engineering knowledge and specialized skills and can apply acquired knowledge using theories and abstract thinking in real life situations.
2. Apply analytic critical and systemic thinking to identify, diagnose and solve engineering problems with a wide range of complexity and variation.
3. Behave professionally and adhere to engineering ethics and standards.
4. Work in and lead a heterogeneous team of professionals from different engineering specialties and assume responsibility for own and team performance
5. Recognize his/her role in promoting the engineering field and contribute in the development of the profession and the community.
6. Value the importance of the environment, both physical and natural, and work to promote sustainability principles.
7. Use techniques, skills and modern engineering tools necessary for engineering practice.
8. Assume full responsibility for own learning and self-development, engage in lifelong learning and demonstrate the capacity to engage in post- graduate and research studies.
9. Communicate effectively using different modes, tools and languages with various audiences; to deal with academic/professional challenges in a critical and creative manner.
10. Demonstrate leadership qualities, business administration and entrepreneurial skills.

11. Evaluate the sustainability and environmental issues related to mechanical power systems.
12. Use energy efficiently.
13. Apply industrial safety.
14. Apply and integrate knowledge, understanding and skills of different subjects and available computer software to solve real problems in industries and HVAC systems and power stations.
15. Lead or supervise a group of engineers, technicians, and work force.
16. Carry out preliminary designs of fluid transmission and power systems, investigate their performance and solve their essential operational problems.
17. Design, operate and maintain HVAC systems, internal combustion engines and steam engines.

7. Program Competencies:

According to the National Academic Reference Standard, the program in Mechanical Power Engineering must satisfy the following Competencies:

1- General Engineering NARS Competencies in 2018		
Level A (NARS)	A.1	Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.
	A.2	Develop and conduct appropriate experimentation and/or simulation, analyze and interpret data, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.
	A.3	Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the discipline and within the principles and contexts of sustainable design and development.
	A.4	Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.
	A.5	Practice research techniques and methods of investigation as an inherent part of learning.
	A.6	Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.
	A.7	Function efficiently as an individual and as a member of multi-disciplinary and multi- cultural teams.

	A.8	Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.
	A.9	Use creative, innovative and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.
	A.10	Acquire and apply new knowledge; and practice self, lifelong and other learning strategies.

2- Mechanical NARS		
Level B (NARS)	B.1	Model, analyze and design physical systems applicable to the specific discipline by applying the concepts of Thermodynamics, Heat Transfer, Fluid Mechanics, solid Mechanics, Material Processing, Material Properties, Measurements, Instrumentation, Control Theory and Systems, Mechanical Design and Analysis, Dynamics and Vibrations.
	B.2	Plan, manage and carry out designs of mechanical systems and machine elements using appropriate materials both traditional means and computer-aided tools and software contemporary to the mechanical engineering field.
	B.3	Select conventional mechanical equipment according to the required performance.
	B.4	Adopt suitable national and international standards and codes, integrate legal, economic and financial aspects to design, build, operate, inspect and maintain mechanical equipment and systems.

3- Mechanical Power ARS		
Level C (ARS)	C.1	Prepare, supervise the implementation of engineering drawings, computer graphics and write, present technical reports.
	C.2	Plan, schedule and use workshop equipment according to the appropriate codes and standards.
	C.3	Design, repair and maintain mechanical systems of fluid transmission networks, internal combustion engines, HVAC, and power plant equipment.
	C.4	Design, evaluate mechanical power and energy for engineering systems, process performance and propose, conduct improvements.

To judge the compatibility of program objectives with its competencies, the following matrix is used:

Program Objectives	Program Competencies																	
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	C1	C2	C3	C4
Objective #1	√	√	√	√						√		√				√		
Objective #2	√	√	√	√		√						√			√	√		
Objective #3					√									√				
Objective #4					√		√			√							√	√
Objective #5														√				
Objective #6								√	√									
Objective #7											√		√				√	√

PROGRAM REQUIREMENTS

Mechanical Design and Production Engineering Program Requirements

#	Requirements	Contact Hours	%	% according to reference framework
1	Humanities & Social Science	20	8	8-12
2	Mathematics & Basic Sciences	64	25.6	20-26
3	Basic Engineering Science	67	26.8	25-30
4	Applied Engineering and Design	71	28.4	25-30
5	Business Administration	11	4.4	2-4
6	Engineering Knowledge	7	2.8	3-6
7	Projects &Training	10	4	3-6
		250	100	100

#	Subjects	Contact Hours	%	Min. Percentage according to reference framework (%)
1	University Requirements	20	8	8
2	Faculty Requirements	70	28	20
3	Major Specialization Subjects	98	39.2	35
4	Minor Specialization Subjects	62	24.8	Maximum 30
		250	100	

LIST OF COURSES MECHANICAL POWER ENGINEERING PROGRAM

No.	Code	Course	Contact Hrs				Credit Hours
			Lec.	Tut.	Lab.	Total	
University Requirements (12+7+1=20 Contact Hours) = (12 Credit Hours)							
1	GEN0x0	Elective - Language requirements List	2	0	0	2	2
2	GEN011	Computer Skills	1	0	1	2	1
3	GEN012	History of Engineering & Technology	2	0	0	2	2
4	GEN9xx	Elective - University Requirements list	1	1	0	2	1
5	GEN9xx	Elective - University Requirements list	1	1	0	2	1
6	GEN9xx	Elective - University Requirements list	1	1	0	2	1
7	GEN9xx	Elective - University Requirements list	1	1	0	2	1
8	GEN9xx	Elective - University Requirements list	1	1	0	2	1
9	GEN9xx	Elective - University Requirements list	1	1	0	2	1
10	GEN9xx	Elective - University Requirements list	1	1	0	2	1
Faculty Requirements (22+ 22+26 =40 Contact Hours) = (40 Credit Hours)							
1	BAS010	Differential Calculus and Algebra	2	2	0	4	3
2	BAS011	Statics	2	1	2	5	3
3	BAS012	Engineering Chemistry	2	1	2	5	3
4	BAS013	Physics of Materials & Electricity	2	1	3	6	1
5	MEC010	Engineering Drawing (1)	0	3	0	3	3
6	BAS014	Integral Calculus & Analytical Geometry	2	2	0	4	3
7	BAS015	Dynamics	2	1	2	5	3
8	BAS016	Physics of Light, Heat and Magnetism	2	1	2	5	3
9	MEC011	Principles of Manufacturing Engineering	1	0	2	3	2
10	MEC012	Engineering Drawing (2)	0	3	1	4	2
11	MEC113	Mechanics & Testing of Materials	2	1	2	5	3
12	MEC210	Engineering Economy & Accounting	2	2	0	4	3
13	MEC310	Engineering Project Management	2	2	0	4	3
14	MEC414	Feasibility Study of Engineering Projects	1	2	0	3	2
15	MEC490	Graduation Project	0	0	10	10	3
16	MEC100	Summer Training	0	0	0	0	0
17	MEC200	Field Training (1)	0	0	0	0	0
18	MEC300	Field Training (2)	0	0	0	0	0
Major Specialization Subjects (39+36+23=98 Contact Hours) = (62 Credit Hours)							
1	MEC110	Mechanical Drawing	1	3	0	4	2
2	ELE170	Electrical Engineering	2	2	0	4	3
3	MEC111	Materials Science	1	1	3	5	2
4	BAS110	Statistics & Theory of Probability	2	2	0	4	3
5	BAS111	Engineering Mechanics	1	3	0	4	2
6	MEC112	Manufacturing Technology (1)	2	1	1	4	3
7	MEC120	Thermodynamics	2	2	1	5	3
8	BAS112	Differential Equations	2	2	0	4	3
9	MEC121	Fluid Mechanics (1)	2	1	2	5	3
10	MEC102	Engineering Mathematics Using Computer	1	0	3	4	3
11	MEC201	Theory of Measurements & Sensors	1	1	3	5	2

12	BAS211	Numerical Analysis	2	2	0	4	3
13	MEC211	Kinematics & Dynamics of Rigid Bodies	2	2	1	5	3
14	MEC212	Manufacturing Technology (2)	2	1	2	5	3
15	MEC213	Mechanical Design (1)	2	4	0	6	4
16	MEC220	Heat Transfer	2	1	2	5	3
17	MEC214	Mechanical Vibrations	2	2	0	4	3
18	ELE270	Electrical Machines	2	1	1	4	3
19	MEC221	Fluid Mechanics (2)	2	1	1	4	3
20	MEC320	Hydraulic & Pneumatic Systems	2	0	3	5	3
21	MEC330	System Dynamics	2	2	0	4	3
22	MEC331	Automatic Control	2	2	0	4	3
Minor Specialization Subjects (23+23+16=62 Contact Hours) = (37 Credit Hours)							
1	MEC321	Applied Thermodynamics	1	2	2	5	3
2	MEC322	Heat & Mass Transfer	1	2	2	5	3
3	MEC324	Computer Application in Energy Field	1	0	3	4	2
4	MEC325	Gas Dynamics	2	2	1	5	3
5	MEC326	Fuel & Combustion	2	2	1	5	3
6	MEC327	Renewable Energy & Environmental Protection	2	1	2	5	3
7	MEC420	Internal Combustion Engines (ICE)	2	2	1	5	3
8	MEC421	Turbomachines	2	2	1	5	3
9	MEC422	Refrigeration & Air Conditioning	2	2	1	5	3
10	MEC423	Power Stations	2	2	0	4	3
11	MEC4xx	Elective (1)	1	2	1	4	2
12	MEC4xx	Elective (2)	1	2	1	4	2
13	MEC4xx	Elective (3)	2	1	0	3	2
14	MEC4xx	Elective (4)	2	1	0	3	2

COURSES CLASSIFICATION MECHANICAL POWER ENGINEERING PROGRAM

No.	Code	Course	Contact Hrs			
			Lec.	Tut.	Lab.	Total
Humanities & Social Science Subjects (12+7+1=20 Contact Hours)						
1	GEN0x0	Elective - Language requirements List	2	0	0	2
2	GEN011	Computer Skills	1	0	1	2
3	GEN012	History of Engineering & Technology	2	0	0	2
4	GEN9xx	Elective - University Requirements list	1	1	0	2
5	GEN9xx	Elective - University Requirements list	1	1	0	2
6	GEN9xx	Elective - University Requirements list	1	1	0	2
7	GEN9xx	Elective - University Requirements list	1	1	0	2
8	GEN9xx	Elective - University Requirements list	1	1	0	2
9	GEN9xx	Elective - University Requirements list	1	1	0	2
10	GEN9xx	Elective - University Requirements list	1	1	0	2
Mathematics & Basic Sciences (25+21+18=64 Contact Hours)						
1	BAS010	Differential Calculus and Algebra	2	2	0	4
2	BAS011	Statics	2	1	2	5
3	BAS012	Engineering Chemistry	2	1	2	5
4	BAS013	Physics of Materials & Electricity	2	1	3	6
5	BAS014	Integral Calculus & Analytical Geometry	2	2	0	4
6	BAS015	Dynamics	2	1	2	5
7	BAS016	Physics of Light, Heat and Magnetism	2	1	2	5
8	BAS110	Statistics & Theory of Probability	2	2	0	4
9	BAS111	Engineering Mechanics	1	3	0	4
10	BAS112	Differential Equations	2	2	0	4
11	BAS211	Numerical & Complex Analysis	2	2	0	4
12	MEC111	Materials Science	1	1	3	5
13	MEC102	Engineering Mathematics Using Computer	1	0	3	4
14	MEC211	Kinematics & Dynamics of Rigid Bodies	2	2	1	5
Business Administration (5+6+0=11 Contact Hours)						
1	MEC210	Engineering Economy & Accounting	2	2	0	4
2	MEC310	Engineering Project Management	2	2	0	4
3	MEC414	Feasibility Study of Engineering Projects	1	2	0	3
Engineering Knowledge Subjects (3+2+2=7 Contact Hours)						
1	MEC011	Principles of Manufacturing Engineering	1	0	2	3
2	ELE170	Electrical Engineering	2	2	0	4
Basic Engineering Science Subjects (23+27+17=67 Contact Hours)						
1	MEC010	Engineering Drawing (1)	0	3	0	3
2	MEC012	Engineering Drawing (2)	0	3	1	4
3	MEC110	Mechanical Drawing	1	3	0	4
4	MEC113	Mechanics & Testing of Materials	2	1	2	5
5	MEC120	Thermodynamics	2	2	1	5
6	MEC121	Fluid Mechanics (1)	2	1	2	5
7	MEC201	Theory of Measurements & Sensors	1	1	3	5
8	MEC220	Heat Transfer	2	1	2	5
9	MEC214	Mechanical Vibrations	2	2	0	4

10	ELE270	Electrical Machines	2	1	1	4
11	MEC221	Fluid Mechanics (2)	2	1	1	4
12	MEC330	System Dynamics	2	2	0	4
13	MEC322	Heat & Mass Transfer	1	2	2	5
14	MEC325	Gas Dynamics	2	2	1	5
15	MEC326	Fuel & Combustion	2	2	1	5
Applied Engineering and Design Subjects (28+25+18=71 Contact Hours)						
1	MEC112	Manufacturing Technology (1)	2	1	1	4
2	MEC212	Manufacturing Technology (2)	2	1	2	5
3	MEC213	Mechanical Design (1)	2	4	0	6
4	MEC331	Automatic Control	2	2	0	4
5	MEC320	Hydraulic & Pneumatic Systems	2	0	3	5
6	MEC321	Applied Thermodynamics	1	2	2	5
7	MEC324	Computer Application in Energy Field	1	0	3	4
8	MEC327	Renewable Energy & Environmental Protection	2	1	2	5
9	MEC420	Internal Combustion Engines (ICE)	2	2	1	5
10	MEC421	Turbomachines	2	2	1	5
11	MEC422	Refrigeration & Air Conditioning	2	2	1	5
12	MEC423	Power Stations	2	2	0	4
13	MEC4xx	Elective (1)	1	2	1	4
14	MEC4xx	Elective (2)	1	2	1	4
15	MEC4xx	Elective (3)	2	1	0	3
16	MEC4xx	Elective (4)	2	1	0	3
Projects and Field Training Subjects (0+0+10=10 Contact Hours)						
2	MEC490	Graduation Project	0	0	10	10
3	MEC100	Summer Training	0	0	0	0
4	MEC200	Field Training (1)	0	0	0	0
5	MEC300	Field Training (2)	0	0	0	0

STUDY PLANS FOR MECHANICAL POWER ENGINEERING PROGRAM

STUDY PLAN

PREPARATORY YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
BAS010	Differential Calculus and Algebra	2	2	0	4	60	0	60	120	3
BAS011	Statics	2	1	2	5	45	30	75	150	3
BAS012	Engineering Chemistry	2	1	2	5	45	30	75	150	3
BAS013	Physics of Materials & Electricity	2	1	3	6	45	45	90	180	3
MEC010	Engineering Drawing (1) ×	0	3	0	3	25	20	60	90	3
GEN0x0	Elective - Language requirements List	2	0	0	2	30	0	30	60	2
		10	**8**	**7**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
BAS014	Integral Calculus & Analytical Geometry	2	2	0	4	60	0	60	120	3
BAS015	Dynamics	2	1	2	5	45	30	75	150	3
BAS016	Physics of Light, Heat and Magnetism	2	1	2	5	45	30	75	150	3
MEC011	Principles of Manufacturing Engineering†	1	0	2	3	25	20	45	90	3
MEC012	Engineering Drawing (2) ×	0	3	1	4	30	30	60	120	3
GEN011	Computer Skills ×	1	0	1	2	15	15	30	60	2
GEN012	History of Engineering & Technology	2	0	0	2	30	0	30	60	2
		10	**7**	**8**	**25**				**750**	

† In workshops, students are divided into groups 15 students/each, and a faculty stuff member (or an assistant) as well as a practical trainer will teach the group.

× In exercises, students are divided into groups 15 students/each. Two faculty stuff members or their assistants will teach each group.

STUDY PLAN (CONT.)

FIRST YEAR

First Semester:

Code	Subject	Contact Hours: Lecture	Tutorial	Laboratory	Total	Marks: Semester Work	Lab./Oral Exam.	Written Exam.	Total	Duration of Final Examination (hours)
MEC110	Mechanical Drawing *×	1	3	0	4	60	0	60	120	4
ELE170	Electrical Engineering	2	2	0	4	60	0	60	120	3
MEC111	Materials Science	1	1	3	5	45	30	75	150	3
BAS110	Statistics & Theory of Probability	2	2	0	4	60	0	60	120	3
BAS111	Engineering Mechanics	1	3	0	4	60	0	60	120	3
MEC112	Manufacturing Technology (1)†	2	1	1	4	30	30	60	120	3
		9	**12**	**4**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours: Lecture	Tutorial	Laboratory	Total	Marks: Semester Work	Lab./Oral Exam.	Written Exam.	Total	Duration of Final Examination (hours)
MEC120	Thermodynamics	2	2	1	5	45	30	75	150	3
BAS112	Differential Equations	2	2	0	4	60	0	60	120	3
MEC121	Fluid Mechanics (1)	2	1	2	5	45	30	75	150	3
MEC113	Mechanics & Testing of Materials	2	1	2	5	45	30	75	150	3
MEC102	Computer Aided Engineering Mathematics	1	0	3	4	30	30	60	120	3
GEN9XX	Elective from University Requirements list	1	1	0	2	20	10	30	60	2
		10	**7**	**8**	**25**				**750**	

* Prior to registering in first year, the student should have completed 3 weeks of summer training in “Computer aided mechanical drawing” (MEC100) for 3 weeks in summer for 5 days per week. The daily training is for 5 hours (2 hrs Lecture + 3 hrs tutorial), amounting to a total of 25 hours per week. A maximum grade of 25 marks is added to the 'semester work' grades of the “mechanical drawing” course (MEC110).

× In exercises, students are divided into groups 15 students/each.Two faculty stuff members or teaching assistants teach each group.

† In workshops, students are divided into groups 15 students/each, and a faculty stuff member (or teaching assistants) as well as a practical trainer will teach the group.

*After completing the second year, the student undergoes field training -1 (MEC300) for 4 weeks during the summer vacation, in a factory, company, firm or project site …etc in a related field. Every 5 students are supervised by a staff member of the department, (this supervision is not included in the staff member's teaching load).

SECOND YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
MEC210	Engineering Economy & Accounting	2	2	0	4	60	0	60	120	3
MEC201	Theory of Measurements & Sensors	1	1	3	5	45	30	75	150	3
BAS211	Numerical & Complex Analysis	2	2	0	4	60	0	60	120	3
MEC211	Kinematics & Dynamics of Rigid Bodies	2	2	1	5	45	30	75	150	3
MEC212	Manufacturing Technology (2)†	2	1	2	5	45	30	75	150	3
GEN9XX	Elective from University Requirements list	1	1	0	2	20	10	30	60	2
		11	**8**	**6**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
MEC213	Mechanical Design (1)	2	4	0	6	60	30	90	180	4
MEC220	Heat Transfer	2	1	2	5	45	30	75	150	3
MEC214	Mechanical Vibrations	2	2	0	4	60	0	60	120	3
ELE270	Electrical Machines	2	1	1	4	40	20	60	120	3
MEC221	Fluid Mechanics (2)	2	1	1	4	40	20	60	120	3
GEN9XX	Elective from University Requirements list	1	1	0	2	20	10	30	60	2
		11	**10**	**4**	**25**				**750**	

† In workshops, students are divided into groups 15 students/each, and a faculty stuff member (or teachingassistant) as well as a practical trainer teach the group.

*After completing the second year, the student undergoes field training -1 (MEC300) for 4 weeks during the summer vacation, in a factory, company, firm or project site …etc in a related field. Every 5 students are supervised by a staff member of the department, (this supervision is not included in the staff member's teaching load).

THIRD YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
MEC310	Engineering Project Management	2	2	0	4	60	0	60	120	3
MEC320	Hydraulic & Pneumatic Systems	2	0	3	5	45	30	75	150	3
MEC330	System Dynamics	2	2	0	4	60	0	60	120	3
MEC321	Applied Thermodynamics	1	2	2	5	45	30	75	150	3
MEC322	Heat & Mass Transfer	1	2	2	5	30	30	60	120	3
GEN9XX	Elective from University Requirements list	1	1	0	2	20	10	30	60	2
MEC300	Field Training (1) *	0	0	0	0	15	15	0	30	-
		9	**7**	**9**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
MEC331	Automatic Control	2	2	0	4	60	0	60	120	3
MEC324	Computer App. in Energy Field	1	0	3	4	30	30	60	120	3
MEC325	Gas Dynamics	2	2	1	5	45	30	75	150	3
MEC326	Fuel & Combustion	2	2	1	5	45	30	75	150	3
MEC327	Renewable Energy& Environ. Prot.	2	1	2	5	45	30	75	150	3
GEN9XX	Elective from University Requirements list	1	1	0	2	20	10	30	60	2
		11	**7**	**7**	**25**				**750**	

* After completing the third year, the student undergoes field training -2 (mec 400) for 4 weeks during the summer vacation, in a factory, company, firm or project site …etc in a related field. Every 5 students are supervised by a staff member of the department, (this supervision is not included in the staff member's teaching load).

FOURTH YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
MEC420	Internal Combustion Engines (ICE)	2	2	1	5	40	30	70	140	3
MEC421	Turbomachines	2	2	1	5	40	30	70	140	3
MEC422	Refrigeration & Air Conditioning	2	2	1	5	40	30	70	140	3
MEC4xx	Elective (1)	1	2	1	4	30	30	60	120	3
MEC4xx	Elective (2)	1	2	1	4	30	30	60	120	3
GEN9XX	Elective from University Requirements list	1	1	0	2	20	10	30	60	2
MEC400	Field Training (2)	0	0	0	0	15	15	0	30	-
		9	**11**	**5**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
MEC414	Feasibility Study of Eng. Projects	1	2	0	3	45	0	45	90	3
MEC423	Power Stations	2	2	0	4	60	0	60	120	3
MEC4xx	Elective (3)	2	1	0	3	45	0	45	90	3
MEC4xx	Elective (4)	2	1	0	3	45	0	45	90	3
GEN9XX	Elective from University Requirements list	1	1	0	2	20	10	30	60	2
MEC490	Graduation Project *	0	0	10	10	180	120	0	300	-
		9	**6**	**10**	**25**				**750**	

* After completing the second semester, the students are divided into groups and continue performing the graduation project for 4 weeks.

LIST OF TECHNICAL LANGUAGES ELECTIVE COURSES

#	Code	Contact Hours	Contact Hrs			
			Lec.	Tut.	Lab.	Total
1	GEN010	English Language	2	0	0	2
2	GEN020	German Language	2	0	0	2
3	GEN030	French Language	2	0	0	2

LIST OF ELECTIVE COURSES FROM UNIVERSITY REQUIREMENTS

#	Code	Contact Hours	Contact Hrs			
			Lec.	Tut.	Lab.	Total
1	GEN900	Communication & Presentation Skills	1	1	0	2
2	GEN901	Theory of Sustainability	1	1	0	2
3	GEN902	Human Rights and Combating Corruption	1	1	0	2
4	GEN903	Research & Analysis Skills	1	1	0	2
5	GEN904	Entrepreneurship	1	1	0	2
6	GEN905	Professional Ethics	1	1	0	2
7	GEN906	Critical Thinking	1	1	0	2
8	GEN907	Human Resources Management	1	1	0	2
9	GEN908	Contracts and Legislation	1	1	0	2
10	GEN909	Method of Scientific Research and Writing	1	1	0	2

LIST OF ELECTIVE COURSES FOR MECHANICAL POWER ENGINEERING PROGRAM

#	Code	Contact Hours	Contact Hrs			
			Lec.	Tut.	Lab.	Total
List (1) of Elective Courses						
1	MEC450	Water Desalination & Wastewater Treatment	1	2	1	4
2	MEC451	Pipeline Networks	1	2	1	4
List (2) of Elective Courses						
1	MEC452	Thermal Equipment	1	2	1	4
2	MEC453	Aerodynamics Engineering	1	2	1	4
3	MEC454	Computational Fluid Mechanics (CFD)	1	2	1	4
List (3) of Elective Courses						
1	MEC455	Numerical Methods in Energy Science	2	1	0	3
2	MEC456	Energy Management Systems	2	1	0	3
3	MEC457	Fire Fighting and Safety Systems	2	1	0	3
List (4) of Elective Courses						
1	MEC458	Advanced Refrigeration & Air Conditioning	2	1	0	3
2	MEC459	Vehicle Engineering	2	1	0	3

MECHANICAL POWER ENGINEERING PROGRAM TREE

	List (1) of Elective Courses	List (2) of Elective Courses	List (3) of Elective Courses	List (4) of Elective Courses

	List (1)			List (2)			List (3)		List (4)	
Elective Courses	MEC450 **Water Desalination & Wastewater Treatment**	MEC451 **Pipeline Networks**	MEC452 **Thermal Equipment**	MEC453 **Aerodynamics Engineering**	MEC454 **Computational Fluid Mechanics (CFD)**	MEC455 **Numerical Methods in Energy Sciences**	MEC456 **Energy Management Systems**	MEC457 **Fire Fighting and Safety Systems**	MEC458 **Advanced Refrigeration & Air Conditioning**	MEC459 **Vehicle Engineering**
Prerequisite	MEC322 **Heat & Mass Transfer**	MEC221 **Fluid Mechanics (2)**	MEC322 **Heat & Mass Transfer**	MEC221 **Fluid Mechanics (2)**	MEC324 **Computer App. in Energy Field**		MEC327 **Renewable Energy & Environ. Prot**	MEC326 **Fuel & Combustion**	MEC422 **Refrigeration & Air Conditioning**	MEC420 **Internal Combustion Engines (ICE**

FOURTH YEAR	MEC420 **Internal Combustion Engines (ICE)**	MEC421 **Turbomachines**	MEC422 **Refrigeration & Air Conditioning**	MEC4xx **Elective (1)**	MEC4xx **Elective (2)**	GEN9XX Elective GEN	MEC414 **Feasibility Study of Eng. Projects**	MEC423 **Power Stations**	MEC4xx **Elective (3)**	MEC4xx **Elective (4)**	GEN9XX Elective GEN	MEC490 **Graduation Project ***
Prerequisite	MEC326 **Fuel & Combustion**	MEC221 **Fluid Mechanics (2)**	MEC322 **Heat & Mass Transfer**				MEC310 **Engineering Project Managemen t**	MEC321 **Applied Thermodynami cs**				

THIRD YEAR	MEC310 **Engineering Project Management**	MEC320 **Hydraulic & Pneumatic Systems**	MEC330 **System Dynamics**	MEC321 **Applied Thermodyna mics**	MEC322 **Heat & Mass Transfer**	GEN9XX Elective GEN	MEC300 **Field Training (2)**	MEC331 **Automatic Control**	MEC324 **Computer App. in Energy Field**	MEC325 **Gas Dynamics**	MEC326 **Fuel & Combustion**	MEC327 **Renewable Energy & Environ. Prot.**	GEN9XX Elective GEN

Benha University

MECHANICAL POWER ENGINEERING 2021

Faculty of Engineering at Shoubra

Prerequisite	MEC210 Engineering Economy & Accounting	MEC221 Fluid Mechanics (2)	MEC214 Mechanical Vibrations	MEC120 Thermodynamics	MEC220 Heat Transfer		MEC200 Field Training (1)	MEC330 System Dynamics	BAS112 Differential Equations	MEC221 Fluid Mechanics (2)	MEC321 Applied Thermodynamics	MEC322 Heat & Mass Transfer	
SECOND YEAR	MEC210 Engineering Economy & Accounting	MEC201 Theory of Measurements & Sensors	BAS211 Numerical & Complex Analysis	MEC211 Kinematics & Dynamics of Rigid Bodies	MEC212 Manufacturing Technology (2)	GEN9XX Elective GEN	MEC200 Field Training (1)	MEC213 Mechanical Design (1)	MEC220 Heat Transfer	MEC214 Mechanical Vibrations	ELE270 Electrical Machines	MEC221 Fluid Mechanics (2)	GEN9XX Elective GEN
Prerequisite		MEC201 Theory of Measurements & Sensors	BAS112 Differential Equations	MEC211 Kinematics & Dynamics of Rigid Bodies	MEC112 Manufacturing Technology (1)	GEN210 Human Rights and Combating Corruption	MEC200 Field Training (1)	MEC113 Mechanics & Testing of Materials	MEC120 Thermodynamics	BAS111 Engineering Mechanics	ELE170 Electrical Engineering	MEC121 Fluid Mechanics (1)	

FIRST YEAR	MEC110 Mechanical Drawing	ELE170 Electrical Engineering	MEC111 Materials Science	BAS110 Statistics & Theory of Probability	BAS111 Engineering Mechanics	MEC112 Manufacturing Technology (1)	MEC120 Thermodynamics	BAS112 Differential Equations	MEC121 Fluid Mechanics (1)	MEC113 Mechanics & Testing of Materials	MEC102 Computer Aided Engineering Mathematics	GEN9XX Elective GEN
Prerequisite	MEC012 Engineering Drawing (2) ×	BAS013 Physics of Materials & Electricity	MEC111 Materials Science		BAS011 Statics BAS014 Dynamics	MEC011 Principles of Man. Technology	BAS016 Physics of Light, Heat and Magnetism	BAS014 Integral Calculus & Analytical Geometry	BAS013 Physics of Materials & Electricity	MEC111 Materials Science BAS111 Engineering Mechanics	GEN011 Computer Skills ×	

PREPARATORY YEAR	BAS010 Differential Calculus and Algebra	BAS011 Statics	BAS012 Engineering Chemistry	BAS013 Physics of Materials & Electricity	MEC010 Engineering Drawing (1) ×	GEN010 Technical English Language	BAS014 Integral Calculus & Analytical Geometry	BAS014 Dynamics	BAS016 Physics of Light, Heat and Magnetism	MEC011 Principles of Man. Technology	MEC012 Engineering Drawing (2) ×	GEN011 Computer Skills ×	GEN012 History of Engineering & Technology

Prerequisite							BAS010 **Differential Calculus and Algebra**	BAS011 **Statics**	BAS013 **Physics of Materials & Electricity**		MEC010 **Engineering Drawing (1) ×**		

Matrix relating the program courses with competencies

Course Code	Course Name	Engineering Competencies (2018)										"Department" Mechanical Engineering Competencies (NARS)				"Discipline" Mechanical Power Engineering Competencies (ARS)			
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	C1	C2	C3	C4
BAS010	Differential Calculus and Algebra	√							√										
BAS011	Statics	√							√										
BAS012	Engineering Chemistry	√							√										
BAS013	Physics of Materials & Electricity	√							√										
MEC010	Engineering Drawing (1) ×			√							√		√				√		
GEN010	Technical Language (English or Germany)							√	√										
BAS014	Integral Calculus & Analytical Geometry	√							√										
BAS015	Dynamics	√							√										
BAS016	Physics of Light, Heat and Magnetism	√							√										
MEC011	Principles of Manufacturing Engineering†			√			√									√	√		
MEC012	Engineering Drawing (2) ×			√							√		√				√		

Course Code	Course Name	Engineering Competencies (2018)										"Department" Mechanical Engineering Competencies (NARS)				"Discipline" Mechanical Power Engineering Competencies (ARS)			
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	C1	C2	C3	C4
GEN011	Computer Skills ×	√	√														√	√	
GEN012	History of Engineering & Technology	√		√					√										
MEC110	Mechanical Drawing *×			√					√		√					√			
ELE170	Electrical Engineering																		
MEC111	Materials Science	√	√	√		√					√	√					√		
BAS110	Statistics & Theory of Probability	√																	
BAS111	Engineering Mechanics	√				√						√							
MEC112	Manufacturing Technology (1)†																√		
MEC120	Thermodynamics	√	√	√								√	√			√			
BAS112	Differential Equations	√																	
MEC121	Fluid Mechanics (1)	√	√						√			√							
MEC113	Mechanics & Testing of Materials	√	√	√		√					√	√					√		
MEC102	Engineering Math. Using Computer																		
GEN900	Communication & Presentation Skills																		
MEC210	Engineering Economy & Accounting	√		√		√			√	√	√		√		√		√	√	
MEC201	Theory of Measurements & Sensors	√	√	√							√	√							√
BAS211	Numerical & Complex Analysis	√	√			√			√		√	√							
MEC211	Kinematics & Dynamics of Rigid Bodies	√				√						√							
MEC212	Manufacturing Technology (2)†	√	√	√			√			√		√			√	√	√		

Course Code	Course Name	Engineering Competencies (2018)										"Department" Mechanical Engineering Competencies (NARS)				"Discipline" Mechanical Power Engineering Competencies (ARS)			
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	C1	C2	C3	C4
GEN902	Human Rights and Combating Corruption																		
MEC213	Mechanical Design (1)			√	√							√	√		√	√			
MEC220	Heat Transfer	√	√	√		√			√		√	√							
MEC214	Mechanical Vibrations	√		√								√				√			√
ELE270	Electrical Machines	√				√		√				√							√
MEC221	Fluid Mechanics (2)	√	√	√		√						√		√					
GEN903	Research & Analysis Skills																		
MEC310	Engineering Project Management	√		√			√			√	√			√			√		
MEC320	Hydraulic & Pneumatic Systems	√	√	√			√		√		√	√		√		√		√	√
MEC330	System Dynamics																		
MEC321	Applied Thermodynamics	√	√	√								√	√			√			
MEC322	Heat & Mass Transfer	√	√	√								√	√			√			
GEN904	Entrepreneurship																		
MEC300	Field Training (1)																		
MEC331	Automatic Control	√	√	√								√				√			√
MEC324	Computer App. in Energy Field	√	√						√										
MEC325	Gas Dynamics	√	√	√		√						√							√
MEC326	Fuel & Combustion	√	√	√	√							√	√	√		√			
MEC327	Renewable Energy & Environ. Prot.	√	√	√		√						√	√	√		√		√	√

Course Code	Course Name	Engineering Competencies (2018)										"Department" Mechanical Engineering Competencies (NARS)				"Discipline" Mechanical Power Engineering Competencies (ARS)			
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	C1	C2	C3	C4
GEN905	Professional Ethics																		
MEC420	Internal Combustion Engines (ICE)	√	√	√	√								√			√		√	√
MEC421	Turbomachines	√		√		√							√	√				√	√
MEC422	Refrigeration & Air Conditioning	√	√	√	√		√				√		√	√	√	√		√	√
GEN906	Critical Thinking																		
MEC300	Field Training (2)																		
MEC414	Feasibility Study of Eng. Projects																		
MEC423	Power Stations	√	√	√								√	√			√			
GEN907	Human Resources Management																		
MEC490	Graduation Project *	√	√	√		√		√		√	√	√	√	√	√	√	√	√	√
Elective Courses																			
MEC450	Water Desalination & Wastewater Treatment	√	√	√	√	√							√	√			√	√	√
MEC451	Pipeline Networks	√	√	√									√		√	√		√	√
MEC452	Thermal Equipment																		
MEC453	Aerodynamics Engineering																		
MEC454	Computational Fluid Mechanics (CFD)																		
MEC455	Numerical Methods in Energy Science																		
MEC456	Energy Management Systems																		
MEC457	Fire Fighting and Safety Systems	√	√	√	√								√	√	√	√	√	√	√

Course Code	Course Name	Engineering Competencies (2018)										"Department" Mechanical Engineering Competencies (NARS)				"Discipline" Mechanical Power Engineering Competencies (ARS)			
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	C1	C2	C3	C4
MEC458	Advanced Refrigeration & Air Conditioning	√	√	√	√								√		√	√	√	√	√
MEC459	Vehicle Engineering	√	√	√										√	√			√	√

Courses Description

PREPARATORY YEAR

BAS010 Differential Calculus and Algebra (2,2,0)

Differentiation: Elementary functions, Polynomials, Exponential, Logarithmic and trigonometric functions, Limits and continuity, Derivative, Implicit differentiation, Maximum and minimum values, Mean value theorem, Taylor’s expansion, Integration ofPolynomials, Exponential and trigonometric functions, Definite integral.

Algebra: Matrices, Algebra of matrices, Eigenvalues and eigenvectors, Positive and negative matrices, Linear systems, Finite series, Complex numbers, Mathematical induction.

References:

1- Basic Technical Mathematics with Calculus Kindle Edition, Pearson; 11th Edition, 2017.
2- Textbook of Basic Mathematics: A Begginer's Guide To Geometry, Trigonometry and Calculus Kindle Edition,, 2017.

BAS011 Statics (2,1,2)

Application on space vectors, resultant of a set of forces, moments, equivalent couple moment, equations of equilibrium for rigid body, types of supports, statically determinate beams and trusses, equilibrium under influence of spatial forces and couples, center of mass (for particles and planer surface), moment of inertia (parallel axes, major axes, planer surface).

References:

1- Engineering Mechanics: Statics & Dynamics by Russell Hibbeler,Pearson; 14th Edition, 2015.

BAS012 Engineering Chemistry (2,1,2)

Gaseous state (gases law), chemical equilibrium and Le Chatellier,principle –solutions- phase diagram- basics of water treatment anddesalination technology- Introduction on thermo chemistry and its rules,basics of fuel combustion, calorimetric and determination of heat ofcombustion –Electrochemistry and conduction in electrolytic solutionsElectrochemical cells and Nernst equation- Corrosion of metals (types,methods of prevention of corrosion – ionic equilibrium and pHcalculation- building materials and some petrochemicals industry.

References:

1- Engineering Chemistry: Alpha Science; Illustrated Edition, 2018

BAS013 Physics of Materials & Electricity (2,1,3)

Properties of matter : Physical quantities, standard units and dimensions, atomic structure (electronic distribution, classification of elements and energy levels), crystalline structure (crystalline grid, symmetry, vacuum groups, some simple examples of crystalline structure), stress and strain, mechanical properties of materials (tensile strength and yield stress, etc.,) Physical properties of liquids, viscosity, surface tension, Archimedes principles, Pascal's law, Bernoull's equation and their applications. Laboratory experiments. Electrical: charge and matter, Coulomb's law, electric field, Gauss's law, electric potential, capacitors and dielectric materials, electrical resistance and electromotive force, Ohm's law, simple electrical circuit, laboratory experiments.

References:

1- Modern Classical Physics: Optics, Fluids, Plasmas, Elasticity, Relativity, and Statistical Physicsby Kip S. Thorne , Princeton University Press, 2017.
2- Basic Physics: A Self-Teaching Guide by K Kuhn, Noah Books, 2018

BAS014 Integral Calculus and Analytical Geometry (2,2,0)

Integration: Hyperbolic functions and inverse functions and their derivatives, derivatives of parametric relations, Methods of integrations, integration by partial fractions, parts, reduction and substitution, Applications of definite integrals for obtaining plane area, volumes, arc length and surface area.

Analytical geometry: Cartesian and polar coordinates, Equation of pair of lines, Equation of circle, Conic sections and their properties, Equation of plane, Equations of sphere, cone and cylinder.

References:

1- Basic Technical Mathematics with Calculus Kindle Edition, Pearson; 11th Edition, 2017.
2- Textbook of Basic Mathematics: A Begginer's Guide To Geometry, Trigonometry and Calculus Kindle Edition,, 2017.

BAS015 Dynamics (2,1,2)

Kinematics of Particle (rectilinear and curvilinear motion, Cartesian coordinates, projectile motion, natural coordinates, polar coordinates, relative motion), kinetics of Particle (acceleration force method), plane kinematics of rigid bodies (translational and rotational motion, general motion: relative velocities, instantaneous center of zero velocity, planer kinetics of rigid body, acceleration forces, work and energy, impact and momentum.

References:

1- Engineering Mechanics: Statics & Dynamics by Russell Hibbeler,Pearson; 14th Edition, 2015.

BAS016 Physics of Light, Heat and Magnetism (2,1,2)

Principles of heat and thermodynamics: Zero law, first and second Law of thermodynamics, heat transfer, gas theory, temperature measurement methods. Light and laser physics: general concepts of light, straight diffusion of light, Velocity of light diffusion, light beam, optical beams, geometric light, reflection and refraction, wave radiation modeling, wave dissipation, diffraction of light, introduction to lasers, Einstein's equations and magnification Light, Explanation of some lasers (gas, solid and liquid lasers), laser applications. Magnetism: magnetic field, Faraday magnetic law, magnetic induction, Boit-savart's law, Ampere's law, laboratory experiments.

References:

1- Modern Classical Physics: Optics, Fluids, Plasmas, Elasticity, Relativity, and Statistical Physicsby Kip S. Thorne , Princeton University Press, 2017.
2- Basic Physics: A Self-Teaching Guide by K Kuhn, Noah Books, 2018

MEC010 Engineering Drawing (1) (0,3,0)

This is an introductory course teaches the basics of technical Drawing using manual drafting instruments. The topics include drawing tools,types of lines, sizes and layout of standard drawing sheets, lettering & numbering, scale use, drawing of geometrical figures, dimensioning, axonometric and isometric views, orthogonal and auxiliary projections,drawing of orthographic projection from isometric view.

References:

1- A Textbook of Engineering Drawing: Along with an Introduction to AutoCAD 2015 by Roop Lal, I K International Publishing House, 2015.

MEC011 Principles of Manufacturing Engineering (1,0,2)

The course introduces the basic concepts of production and productivity. The topics includeclassification of production processes, industrial safety, engineering materials, ferrous and non-ferrous alloys, steel and its types, cast iron and its types, steel and cast iron production, metal castingprocesses (sand casting, mold casting, centrifugal casting, wax casting,hot and cold metal forming processes (extrusion, forging, rolling, deep drawing, wire drawing, etc.), metal cutting processes (turning, milling, shaping, drilling, grinding, etc.),metal joining techniques (welding processes, rivets, bolts … etc).Simple workshop measuring tools (Vernier caliper, micrometers, etc.), practical skills in workshops.

References:

1- Workshop Technology (Manufacturing Process) by S. K. Garg, Laxmi Publications; 3rd Revised edition, 2009.

MEC012 Engineering Drawing (2) (0,3,1)

Deduction of the missing orthogonal views, sections in machine members, hatching rules, intersections of solids and surfaces, development of surfaces, drawing of steel structures. Basics of computer aided drafting (CAD) using AutoCAD: Workspace,toolbars,coordinate systems,setting up 2D drawing environment,drawing tools in AutoCAD,object snap,modificationtools in AutoCAD,texting and dimensioning in AutoCAD.

References:

1- A Textbook of Engineering Drawing: Along with an Introduction to AutoCAD 2015 by Roop Lal, I K International Publishing House, 2015.

FIRST YEAR

MEC110 Mechanical Drawing (1,3,0)

This course aims to provide the students with basic knowledge on assembly drawings and representation of mechanical components. The topics include:Sections in machine members, Assembly and detailed drawings,Fits and tolerances, Geometrical tolerances, Surface texture and roughness symbols, Welding symbols.The students can Identifythe different types of machine elements like gears, shafts and keys, journal bearings, anti-friction bearings, springs, valves,pulleys, pipelines, clutches and breaks ...etc. Applications on assembly drawings of jacks, vices, valves, gearboxes …etcare provided. Applications using of 3D modeling software (like SolidWorks or Autodesk Inventor) to draw and assemble machine components to construct a complete complex machine in addition to make detailed drawings.

References

1- Textbook of Engineering Drawing, K. VenkataReddy, Second Edition, BS Publications, 2008.
2- Machine Drawing – K.L, Narayana, P.Kannaiah, and K. VenkataRedd, New age Int. Publisher, Third Edition.
3- Geometric and Engineering Drawing, Ken Morling, 3rdEdition, 2012.

ELE170 Electrical Engineering (2,2,0)

Electrical circuits basics (resistors –coils- capacitors -Various sources of electrical waves) DC circuits and electrical theories(Kirchhoff - Thevenin - Norton - assembly) - nodes and tracks equations –AC current circuits and phasor diagram to represent it - A balanced and unbalanced 3-phase system–resonance in electrical circuits and frequency domain response–harmonics in electrical circuit.

References

1- James, W. Nilsson,"Electric Circuits " 7th Edition,2009
2- Joseph,A."Electric Circuits"McGraw-Hill International Book Company,New York ,1972.

MEC111 Materials Science (1,1,3)

Atomic structure, interatomic bonding and structure of crystalline solids, defects in crystalline solids, dislocations and strengthening mechanisms, phase diagrams, iron-carbon phase diagram, , phase transformation and heat treatment of metals, time-temperature-transformation (TTT) diagrams, Steels and its alloys, Cast iron and its alloys, Non-ferrous alloys (aluminum, copper, magnesium, zinc).The structure of polymers, ceramics and composite materials.

References

1- Material science and engineering: an introduction, W.DCallister, Jr., 8thedition.
2- Essentials of Materials Science and Engineering, Donald R. Askelandand Pradeep P. Fulay, 2nd Edition.
3- Materials for engineering, J. W. Martin, 3rdedition

BAS110 Statistics & Theory of Probability (2,2,0)

Descriptive statistics, Statistical classification of data, Measures of central tendency, Measures of dispersion, Probability theory, Independent and dependent events, Conditional probability, Bayes theorem, Random variable, Probability density function, Discrete probability distributions, Continuous probability distributions, Central limit theorem, Test of hypothesis.

References

1- Foundations of the Theory of Probability, A N Kolmogorov, 2018

Probability and Mathematical Statistics: Theory, Applications, and Practice, Mary C. Meyer, ISBN-13: 978-1611975772.

BAS111 Engineering Mechanics (1,3,0)

Statics: internal forces, friction, center of mass, virtual work. Dynamics: moment of inertia, work and energy, impulse and impact, introduction to mechanical vibrations.

References

1- Engineering Mechanics (Dynamics), by R.C. Hibbeler, 6th edition, Macmillan Publishing company.
2- Vector mechanics for Engineers (Dynamics), by Beer and Johnson.
3- Elements of statics and dynamics, by S.L. Long.

MEC112 Manufacturing Technology (1) (2,1,1)

The topics include conventional machining operations such as turning, drilling, milling, shaping and gear cutting, grinding ...etc. Calculation of machining and production times, dimensional measurements and tools, operations sequences and operation cards. Introduction to production management and planning, Introduction to cost analysis. Practical applications in workshops.

References

1- Manufacturing Technology, Part I, C. Elanchezhian, B. Vijaya Ramnath, 2nd edition, 2006.
2- Manufacturing Technology, Part II, C. Elanchezhian, B. Vijaya Ramnath, 2nd edition, 2007.
3- Introduction to Basic Manufacturing Processes and Workshop Technology, Rajender Singh, New age Int. Publisher, 2006.

MEC120 Thermodynamics (2,2,1)

Basic concepts of thermodynamics, energy concepts, pure materials and the use of steam tables, ideal gas model, first law of thermodynamics and its applications, energy equation for closed systems and their applications on different thermal processes, energy equation for open systems, procedures for instability and stability of open systems, reversible procedures and non-reversible procedures , the second law of thermodynamics, Carnot cycle, thermal machines and its efficiencies, entropy and change in entropy, the definition of entropy efficiencies , possible Energy, reversible work, and availability analysis.

References

1- Yunus, A. C, Thermodynamics, An Engineering Approach, McGraw-Hill, 8th edition, 2010.
2- Van Wylen, G. Sonntag R. and Borgnakke, C. Fundamentals of Classical Thermodynamics, John Wiley & Sons, Inc. 6th edition, 2001.

BAS112 Differential Equations (2,2,0)

Functions of several variables, Partial differentiation, Maximum and minimum values, Conditional extrema, Curvature, Double and triple integrals, Line integral, Ordinary differential equations, first order and higher order, Linear Systems of ordinary differential equations, Vectors analysis, Gradient, Laplace transformations, Inverse Laplace transformations.

References

1- Elementary Differential Equations and Boundary Value Problems, William E. Boyce, Richard C. DiPrima, Douglas B. Meade, ISBN-13: 978-1119443766.
2- Schaum's Outline of Differential Equations, 4th Edition (Schaum's Outlines) 4th Edition, by Richard Bronson, Gabriel Costa, ISBN-13: 978-0071824859.

MEC121 Fluid Mechanics (1) (2,1,2)

Introduction and basic concepts and fluid properties, fluid statics and hydrostatic pressure forces and their applications, fluid flow characterization, fluid motion principles and fluid kinematic , concept of controlled volume and integral equation for Reynolds theory, law of mass conservation and its applications, law of momentum conservation and its applications, energy conservation law ,Bernoulli equation and its applications, Basics of dimensional analysis and dynamic symmetry, laminar and turbulent flow in pipes, friction coefficient and major and minor losses, flow in pipes and tubes and piping system.

References

1- Fundamentals of Fluid Mechanics By B.R. Munson, D.F. Young, T.H. Okiishi, W.W. Huebsch 6thEditon, Wiley, NY (2010)
2- Fluid Mechanics: Fundamentals and Applications By Y. Cengel, McGraw-Hill, NY (2006).
3- Fluid Mechanics By F. M. White, McGraw-Hill, NY (2003).
4- Introduction to Fluid Mechanics By R.W. Fox, A.T. McDonald, and P.J. Pritchard, Wiley, NY (2004).
5- Elementary Fluid Mechanics By R. L. Street, G.Z. Watters, and J.K. Vennard, Wiley, NY (1996).
6- Engineering Fluid Mechanics by Donald F. Elger, Barbara C. Williams, Clayton T. Crowe, John Wiley & Sons; 9thedition, 2009.

MEC113 Mechanics & Testing of Materials (2,1,1)

Study of the mechanical behavior of solid bodies (bars, axes, beams, etc.) under the effect of different loads, thermal stresses, the relationship between uniform strain and stress, axial deformation (uniaxial), shear forces and bending moments in beams, stress in beams, torsion in shafts and pipes with thin walls, combined loads, pressure vessels with thin walls, analysis and transformation of plain stresses and strains. Mechanical tests of the materials (hardness - impact - tension - compression - bending - shear - torsion - wear - creep), non-destructive tests of metals (X-ray diffraction - ultrasonic waves - magnetic methods ... etc.), practical experiments in the laboratory to perform the mechanical tests.

References

1- Testing of Engineering Materials by: Carl William Muhlenbruch
2- Hibbeler, R. C. Mechanics of Materials. 6th ed. East Rutherford, NJ: Pearson Prentice Hall, 2004. ISBN: 9780131913455.
3- Crandall, S. H., N. C. Dahl, and T. J. Lardner. An Introduction to the Mechanics of Solids. 2nd ed. New York, NY: McGraw Hill, 1979. ISBN: 9780070662308.
4- Vernon John. Testing of Materials, Macmillan, 1992. ISBN: 0333447832, 9780333447833

MEC102 Engineering Mathematics Using Computer (1,0,3)

Introduction to MATLAB and the basics of computer programming using MATLAB. MATLAB environment, MATLAB variables, vectors, matrices, matrix algebra, 2D and 3D plots, conditional loops, scripts, functions, file Input-Output, structures, cells. Using MATLAB for solving linear and nonlinear equations, differential equations and numerical integration. Applications in fluid mechanics, mechanics, statistics …etc.

References

1- Computer Programming with MATLAB, J. Michael Fitzpatrick, ÁkosLédeczi, 2015
2- An Engineer's Introduction to Programming with MATLAB 2018, Shawna Lockhart, Eric Tilleson.

SECOND YEAR

MEC210 Engineering Economy & Accounting (2,2,0)

The basic concepts of engineering economy, Time-money relationships, cash flow, and effects of inflation, Present worth (PW) method, annual worth (AW) method, rate of return (ROR) method, benefit/cost ratio (B/C) method, and incremental rate of return analysis, Depreciation schedules, replacement analysis, and after-tax analysis, cost estimation and indirect cost allocation,break-even analysis and payback period, selection among competing alternatives, Sensitivity analysis and expected value decisions.

References

1- Sullivan; wicks and koelling "Engineering Economy" 6thed. 2015 by Pearson h. Ed Inc
2- Blank and Tarquin "Engineering Economy" 8thed. 2018 by McGraw hill.

MEC201 Theory of Measurements & Sensors (1,1,3)

Basic concepts of measurements and analysis of experimental results; introduction and fundamentals of measurement and calibration devices; measurement errors, measurements Linearity; different statistical methods; static and dynamic characteristics of sensors; adaptation of measurement signals; measurement of the displacement, velocity, acceleration, temperature, pressure, strain, flow, force; signal adaptation; actuators (mechanical, hydraulic, pneumatic, electrical); Dimensions Tolerances and allowances; basics, design and application of limit measurement parameters.

References

1- Measurement & Instrumentation Principles,3rd Edition by Morris
2- Measurement and Instrumentation. Theory and Application, Alan S. Morris, Reza Langari 2012
3- Maintenance of Instruments and Systems [2 ed.], Lawrence D. Gottschee, Lawrence D. Gottschee 2004

BAS211 Numerical Analysis (2,2,0)

Numerical differentiation and integration, Solving system of linear equations, Solving system of nonlinear equations, Numerical methods for solving ordinary differential equations, Partial differential equations, Wave and heat equations, Fourier series and Fourier integrals, Integration by residue theorem.

References

1- Numerical Methods for Scientists and Engineers, R. W. Hamming, ISBN-13: 978-0486652412.
2- A First Course in Numerical Analysis: Second Edition, Anthony Ralston, Philip Rabinowitz, ISBN-13: 978-0486414546.
3- Complex Analysis, 3rd ed. 2010 Edition, Joseph Bak, Donald J. Newman, ISBN-13: 978-1441972873.

MEC211 Kinematics & Dynamics of Rigid Bodies (2,2,1)

Kinematics machines: Types of mechanisms, degree of freedom of mechanisms, Kinematics movement of the rigid objects, introduction to planner mechanisms, kinematics analysis of the planer mechanisms: (Displacement, velocity, acceleration), the characterization of the different types of gears (simple, composite, planetary) design and analysis of the form of camshafts and attachments, Kinematics of belts and chains. Machines dynamics: planar motion dynamics of the rigid bodies, analysis of the static and dynamic forces at mechanisms, the dynamics of reciprocating machines, sketches of rotation torque diagrams, dynamic equilibrium, gyroscope, design of the appropriate flywheels for different engines and various mechanisms.

References

1- R.C. Hibbeler, “Engineering Mechanics: Dynamics,” 9th edition, Prentice Hall, 2001.
2- F.P. Beer and E.R. Johnston, “Mechanics for Engineers: Statics,” 4th edition, McGraw-Hill book company, 1984.
3- Bedford and W. Fowler, “Engineering Mechanics: Statics & Dynamics Principles,” Prentice Hall, 2003.

MEC212 Manufacturing Technology (2) (2,1,2)

Introduction to foundry technology, pattern making and design, technology of moulding and core making, testing of moulding sand, different types of moulding sand and their properties, gating system design and risering, melting technology, casting defects and its remedy, casting methods-Fettling and heat treatment of casting- Welding technology: Basic aspects of welding, solid state welding methods, fusion welding methods, welding defects and remedy, destructive and non-destructive tests.

References

1- Principles of Foundry Technology, 4th edition, P. L. Jain.
2- A Textbook of Manufacturing Technology, Er. R.K. Rajput.
3- Workshop Technology, S.K., Garg.
4- Manufacturing Process, B.H. Amstead, Phillip Ostwald, Myron L. Begemaw.
5- Workshop Technology, Vol. II, Dr. R.K. Singal
6- Manufacturing Engineering and Technology, Schmid, S. , and Kalpakjian , S., Pearsan Education, Inc., 6th Edition, 2006
7- اساسيات هندسة صب (سباكة) المعادن د. احمد سالم الصباغ – هندسة عين شمس.
8- تكنولوجيا الانتاج والتصنيع د. محمد صلاح الدين عباس حامد – د. ابراهيم موسى ابراهيم.

MEC213 Mechanical Design (1) (2,4,0)

Concepts of mechanical design, primary steps of the mechanical design, engineering materials, engineering manufacturing considerations of the mechanical design, design of mechanical parts under the effect of static and repeated loads, stress concentration, safety factor, bolts design, design of temporary and permanent joints (by thread bolts, welding, rivets), design of power screws, design of springs, design of pipe joints, design of hydraulic cylinders, design of pressure vessels.Design projects using 3D modeling programs such as (SolidWorks or Autodesk Inventor).

References

1- Richard G. Budynas, and J. Keith Nisbett, Shigley's Mechanical Engineering Design 9th Edition, McGraw Hill, ISBN 978-0-07-352928-8 (alk. paper)
2- Black and Adams and Machine Design.
3- GalalShawki and Design Data Tables
4- R.S. Khurmi, J.K. Gupta, A Textbook of Machine Design, Eurasia Publishing House (PVT.) LTD., 2005.

MEC220 Heat Transfer (2,1,2)

Introduction to heat transfer methods, one dimensional conduction, conduction with internal source of heat, continuous conduction in two directions, unstable conduction in one direction, Convection heat transfer, natural and forced convection, extended surfaces, Fins.

References

1- Frank P. Incropera, David P. Dewitt. "Introduction to Heat Transfer" 6th Edition.
2- Kreith, F. and Black, W. Z., Basic Heat Transfer, Harper and Row Publishers, New York (2000).
3- Kreith, F., Principles of Heat Transfer, Crowell, New York (2005).

MEC214 Mechanical Vibrations (2,2,0)

Properties of vibrational motion, derivation of the governing differential equations, free and damping vibration, forced harmonic motion, the imbalanced rotation and reciprocation, the motion of carriages, vibration isolation, transmitted vibration, free vibrations of systems with two-degrees of freedom, instant analysis, vibration of system with many degrees of freedom, continuous systems, numerical and computational methods to determine the natural frequencies.

References

1- Engineering Vibration Analysis with Application to Control Systems, Edward Arnold, 1995
2- Mechanical Vibration, by William J. Palm III, ISBN-13: 978-0471345558
3- Singiresu S. Rao, Mechanical Vibrations 5th Edition, ISBN-13: 978-0132128193.

ELE270 Electrical Machines (2,1,1)

Three-phase systems, the basics, power, transmission, DC machines, the electric generator, electric motors, AC machines, generator, induction motor, Synchronous motor, special motors, electric transformer, equivalent circuits, design characteristics, substation, circuit breakers, insulators, main conductors, protection.

References

1- A Text Book of Electrical Technology Vol. II AC & DC Machines, Theraja B. L., Published by S Chand and Company Limited, 2007
2- Electrical Transformers and Rotating Machines 4th Edition, Stephen L. Herman, ISBN-13: 978-1305494817
3- Transformer Principles and Applications, Otto Taylor, Jim Overmyer , Ron Michaelis, ISBN-13: 978-0826916044

MEC221 Fluid Mechanics (2) (2,1,1)

Navier-Stokes equations for fluid flow, Approximate and analytical solutions for differential equations, ideal flow, laminar flow, laminar flow on horizontal and inclined planes, boundary layers, an introduction to turbulent flow and physical nature,mathematical modeling examples, unstable flow in pipes and water hammer.

References

1- Fundamentals of Fluid Mechanics, B.R. Munson, D.F. Young, T.H. Okiishi, W.W. Huebsch 6^{th}Edition, Wiley, NY (2010)
2- Fluid Mechanics: Fundamentals and Applications, Y.Cengel, McGraw-Hill, NY (2006).
3- Fluid Mechanics, F. M. White, McGraw-Hill, NY (2003).
4- Introduction to Fluid Mechanics, R.W. Fox, A.T. McDonald, and P.J. Pritchard, Wiley, NY (2004).
5- Elementary Fluid Mechanics, R. L. Street, G.Z. Watters, and J.K. Vennard, Wiley, NY (1996).
6- Engineering Fluid Mechanics, Donald F. Elger, Barbara C. Williams, Clayton T. Crowe, John Wiley & Sons; 9^{th}edition, 2009.

THIRD YEAR

MEC310 Engineering Project Management (2,2,0)

Introduction engineering project management, projects analysis, network analysis samples, balancing of time and cost, resources planning, monitoring and control of engineering projects, performance evaluation of engineering projects, the concept of a feasibility study, elements of feasibility study, planning and control of the small projects, use of computer for planning and control of the projects using the Microsoft Project software, case studies and applications.

References

1- Engineering Project Management, Neil Siegel, 2019 John Wiley & Sons, Ltd.
2- Engineering Project Management for the Global High-Technology Industry – Sammy G. Shina, last edition
3- Engineering Design, Planning, and Management – Hugh Jack, last edition

MEC320 Hydraulic & Pneumatic Systems (2,0,3)

Introduction to Fluid Systems, Main parts of pneumatic circuits and hydraulic circuits (joints and fittings), Compressors, Pumps, pneumatic and hydraulic motors, maintenance and safety in fluid systems, electrostatic control in hydraulic and pneumatic circuits.

References

1- Introduction To Hydraulics and Pneumatics, 3rd Ed, Ilango Sivaraman, PHI Learning Pvt. Ltd., 2017.
2- Fluid Power Dynamics, By R. Keith Mobley, Newnes Publisher, 2000.
3- Hydraulics and Pneumatics: A Technician's and Engineer's Guide, Andrew Parr, Elsevier, 2011.

MEC330 System Dynamics (2,2,0)

Natural systems (mechanical, electric, hydraulic, thermal…), modeling using signal diagram, simulation definition (simulation for natural parts and simulation with programs), principles of simulation of natural systems (mechanical, electrical, hydraulic, thermal, medical), simulation techniques via computer, applications using modern software packages such as MATLAB or LabVIEW.

References

1- System Dynamics: Modeling, Analysis, Simulation, Design, Ernest Doebelin, ISBN-13: 978-0824701260
2- System Dynamics: Modelling and Simulation, Bilash Kanti Bala, Fatimah Mohamed Arshad, Kusairi Mohd Noh, Springer, 2017.

MEC321 Applied Thermodynamics (1,2,2)

Vapor power cycles (Rankine cycle), Modifications to enhance cycle performance, Cogeneration cycle, Binary cycle, Air standard cycles, Gas turbine power cycle and its modifications to improve cycle performance, Jet propulsion cycle, Combined cycle, Refrigeration cycles (Reversed Carnot cycle, Vapor compression refrigeration cycle, Absorption cycle, Air cycle), Non reacting mixtures, Gas and vapor mixtures, Properties of air and water vapor mixture (Psychometry).

References

1- Yunus, A. C, Thermodynamics, An Engineering Approach, McGraw-Hill, 8thedition, 2010.
2- Van Wylen, G. Sonntag R. and Borgnakke, C. Fundamentals of Classical Thermodynamics, John Wiley & Sons, Inc. 6thedition, 2001.

MEC322 Heat & Mass Transfer (1,2,2)

Heat transfer in boiling and condensation, Heat exchangers and their types, Design of heat exchanger and effectiveness calculation, Methods of heat transfer enhancement, Thermal radiation, Combined convection and radiation heat transfer, Heat transfer by radiation exchange between surfaces, Heat transfer by radiation transfer between flames and gases, radiation and environment, Heat and mass transfer analogy, Mass transfer in gas, liquid and solid media, Mass transfer applications.

References

1- Frank P. Incropera, David P. Dewitt. "Introduction to Heat Transfer" 6th Edition.
2- Kreith, F. and Black, W. Z., Basic Heat Transfer, Harper and Row Publishers, New York (2000).
3- Kreith, F., Principles of Heat Transfer, Crowell, New York (2005).
4- Theodore L. Bergman , Adrienne S. Lavine, Frank P. Incropera David P. DeWitt, Fundamentals of Heat and Mass Transfer, 7th Edition.
5- An Introduction to Mass and Heat Transfer: Principles of Analysis and Design, Stanley Middleman, 1997.

MEC300 Field Training (1) (0,0,0)

Duration of the training: four weeks equivalent to 160 training hours (8 Hours per day × 5 Business Day × 4 Weeks). The student is required to spend a month in an industrial facility for training that is relevant to his/her field of study. The department council will assign the faculty members to set the training plan with the industrial partners and to follow up on the student's progress. The students will be divided into groups, each consists maximum of 5 students. At the end of the training period, the student is required to submit a report and give a presentation before an examination panel from the department and/or industrial partners. In the report and presentation, the student would highlight the achievements and/or challenges she/he has gone through during the training period. 25 marks of the student's score is provided by the industrial training supervisor and the remaining 25 marks is determined based on: the student's report, final presentation, and how well the student responds to the examination board questions.

References

According to the field of training

MEC331 Automatic Control (2,2,0)

Transient response for 1st and 2nd degree control system, root locus method, stability analysis (Nyquist, phase angle margin, gain margin), control system compensation (Bode diagram, polar plots, log magnitude versus phase plots, lead-lag-lead/lag compensation, polar and Bode plots for compensator, an introduction for pole placement based on feedback, design of observer and compensator based on the dynamic feedback, data analytics, design of industrial controller of type (proportional P, Integrator I and differentiator D then PI and PID, introduction to state space, introduction to controllability and observability.

References

1- Automatic Control Systems 7th Edition, Kuo, Benjamin C., JhonWiely& Sons, 2003.
2- Modern Control Engineering, K. Ogata, Printice Hill, 2010.
3- Automatic control System, F.Golnaraghi, Johon Wiley, 2010.

MEC324 Computer Applications in Energy Field (1,0,3)

MATLAB software in engineering applications for different energy fields, Simulation of thermal systems performance, computer application in heat transfer (conduction – convection – radiation), Computer application in energy systems, computer applications in fluid dynamics.

References

1- Solar Energy Fundamentals and Design: With Computer Applications, Wiley, 1985.
2- Modeling of Photovoltaic Systems Using MATLAB: Simplified Green Codes, Tamer Khatib, WilfriedElmenreich, John Wiley & Sons, 2016
3- ANSYS Fluent in ANSYS Workbench User's Guide, ANSYS, Inc.

MEC325 Gas Dynamics (2,2,1)

Brief review in gas thermodynamics, compressible flow, characteristics and governing equations for one dimensional compressible flow, flow characteristics in variable area passages, one dimensional steady isentropic flow with friction (Fanno line), flow with heat transfer (Rayleigh line), critical Mach number, Subsonic and supersonic flow, normal and oblique shock waves, expansion waves, one dimensional asymptotic flow, unsteady flow, flow in constant area with and without friction, supersonic nozzle design, conical flow theory.

References

1- Modern Compressible Flow with Historical Perspective by J.D. Anderson, McGraw-Hill, 3rd Edition, 2002.
2- Fundamentals of Gas Dynamics 2nd Edition, Robert D. Zucker and Oscar Biblarz, ISBN-13: 978-0471059677, 2002.

MEC326 Fuel & Combustion (2,2,1)

Fuels types and characteristics, chemical reaction in theoretical and actual combustion, enthalpy of formation, enthalpy of reaction, first and second law analysis of combustion, chemical equilibrium, phase equilibrium, premixed and non-premixed flames and their theories, introduction to industrial furnaces, heat transfer in industrial furnaces, energy saving in industrial furnaces.

References

1- Stephen R. Turns, "Introduction to combustion – Concepts and Applications, McGraw Hill, 3rd Edition, 2011.

2- Irvin Glassman, and Richard A. Yetter, Combustion, Fourth Edition, Academic Press is an imprint of Elsevier, 2008.
3- J. Warnatz, U. Maas, and R.W. Dibble, Combustion-Physical and Chemical Fundamentals, Modeling and Simulation, Experiments, Pollutant Formation, 4th Edition, Springer-Verlag Berlin Heidelberg, 2006.

MEC327 Renewable Energy & Environmental Protection (2,1,2)

Introduction, different energy resources, solar energy and methods of use, wind energy and its conversion systems, biomass energy and system of use, hydraulic energy, systems and turbines used, energy storage, energy economics.

References

1- Fundamental of Renewable Energy Processes, Aldo V. Da Rosa, Stanford University, El SEVIER Academic Press, 2005.
2- Solar Engineering of thermal processes, John A. Duffie, William A. Beckman, John Willey & Sons, Second Edition.
3- Renewable Energy and the Environment, Robert Foster, Majid Ghassemi, CRC Press, 2010.
4- Physics of Solar Energy C. Julian Chen, Jhon Wiley & Sons, 2011.

FOURTH YEAR

MEC420 Internal Combustion Engines (ICE) (2,2,1)

Introduction to internal combustion engines, Characteristics of operation of internal combustion engines- actual internal combustion engine cycles, self-ignition, knocks and detonation, ignition systems in internal combustion engines, engine combustion chambers, fuel/air ratio requirements, carburetor, engine performance and testing, air pollution from combustion engines and their control.

References

1- Internal Combustion Engine Fundamentals, Second Edition John B. Heywood
2- Internal Combustion Engine (ICE) Fundamentals, Carlo N. Grimaldi Federico Millo
3- Introduction to Internal Combustion Engines 3rd Edition by Richard Stone

MEC421 Turbomachines (2,2,1)

Introduction and fluid machines classifications, similarity and dimensional analysis, performance curves of fluid machines, one dimensional flow in fluid machines, definition of different types of efficiency, actual gas turbine cycles, operating point and connections of pumps, cavitation phenomenon in pumps, centrifugal pump parts and operation, flow through centrifugal pump, design of centrifugal pump, hydraulic turbine classifications, Pelton wheel, Francis turbine, Kaplan turbine, hydraulic power transmission methods, Two dimensional analysis of axial compressor stage, axial gas turbine, performance of axial flow turbines, degree of reaction, stage loading, stage losses, centrifugal gas turbines, performance of centrifugal gas turbines, determination of slip coefficient and conditions for ideal flow in compressor, axial gas turbines, axial steam turbines, radial gas turbines, radial steam turbines, impulse steam turbines.

References

1- ‘‘Turbomachines” by B U Pai
2- Principles of Turbomachinery Seppo A. Korpela
3- “Incompressible Flow Turbomachines: Design, Selection, Applications, And Theory” by George F Round
4- “Incompressible Flow Turbomachines: Design, Selection, Applications, and Theory” by G F Round

MEC422 Refrigeration & Air Conditioning (2,2,1)

Properties of refrigerants, multi-pressure vapor compression refrigeration systems, refrigeration compressors, condensers and their types, evaporators and their types, expansion devices, absorption refrigeration systems, air refrigeration systems, non-conventional refrigeration systems, air conditioning processes, basic air conditioning cycles, introduction to load estimation, air conditioning systems and basic equipment.

References

1- “Refrigeration and Air Conditioning” by Arora C P
2- “A Text book of Refrigeration and Air conditioning” by Kurmi R S and J K Gupta
3- “Basic Refrigeration and Air Conditioning” by Ananthanarayanan

MEC400 Field Training (2) (0,0,0)

Duration of the training: four weeks equivalent to 160 training hours (8 Hours per day × 5 Business Day × 4 Weeks). The student is required to spend a month in an industrial facility for training that is relevant to his/her field of study. The department council will assign the faculty members to set the training plan with the industrial partners and to follow up on the student's progress. The students will be divided into groups, each consists maximum of 5 students. At the end of the training period, the student is required to submit a report and give a presentation before an examination panel from the department and/or industrial partners. In the report and presentation, the student would highlight the achievements and/or challenges she/he has gone through during the training period. 25 marks of the student's score is provided by the industrial training supervisor and the remaining 25 marks is determined based on: the student's report, final presentation, and how well the student responds to the examination board questions.

References

According to the field of training

MEC414 Feasibility Study of Engineering Projects (1,1,0)

Basic concepts in feasibility study, market feasibility study, technical and engineering study,financial feasibility study, commercial feasibility study for small projects.

References

1- Feasibility Study Preparation and Analysis by Charles Zawde, 2017.

MEC423 Power Stations (2,2,0)

Classification of power plants, factors affecting the performance of power stations, steam power plants and components, boilers, superheaters, reheaters, economizers, air preheaters, Boilers of various types: methods of operation, performance factors and their heat balance, recent trends of steam generation, condensers and cooling towers, types and performance factors, steam and gas turbines systems, Cogeneration, Determination of fuel cost for additional capacity and investment cost of cogeneration Units, Load analysis and storage, economics in power plants: daily load, annual load, different control devices, power generation and the environmental impact.

References

1- "Power Plant Engineering" by Derbal L F and Boston P G
2- "Power Plant Performance" by Gill A. B.
3- "Power Plant Engineering" by Nag.
4- "Power Plant Instrumentation and Control Handbook" by SwapanBasu
5- "Boiler Control Systems" by D Lindsay.

MEC490 Graduation Project (0,0,10)

This course requires the students, working in teams, to take an actual engineering project from the initial proposal stage through the preliminary design phase to the completion of a conceptual design of the project. Students will conduct the necessary activities and prepare the various documents needed to complete the design. The project should include a theoretical analysis as well as implementation of some parts of the project experimentally or simulation by computer.

References

According to the field of the project

ELECTIVE COURSES

List (1) of Elective Courses

MEC450 Water Desalination & Wastewater Treatment (1,2,1)

Water chemistry, physical properties of water, water desalination technologies and the available technologies, thermal methods in water desalination, multistage eater desalination plants (MEE, MSF), design calculations for desalination plants, solar desalination, humidification and dehumidification water desalination, reverse osmosis theory, system components and design calculation, energy recovery systems.

References

1- Handbook of Water and Wastewater Treatment Technologies by Nicholas P. Cheremisinoff, 2002.
2- Desalination and Water Treatment Murat Eyvaz, Ebubekir Yüksel,2018

MEC451 Pipeline Networks (1,2,1)

Introduction to pipelines network and their uses and the economic feasibility of their study, fundamentals of fluid transmission, estimation of friction and secondary losses in pipes, The optimal discharge and pressure in liquids distribution pipelines network, pipelines fittings, valves, pumps, static performance characteristics of hydraulic machines, methods of calculation and selection of hydraulic pumps and their motors and valves, control of fluid distribution networks, study the stresses on the buried networks, leakage detection in pipelines networks, water hammer causes and methods of treatment, examples and practical cases.

References

1- Design of Water Supply Pipe Networks, Prabhata K. Swamee, Ashok K. Sharma, John Wiley & Sons,, 2008.

List (2) of Elective Courses

MEC452 Thermal Equipment (1,2,1)

Introduction to thermal equipment, thermal equipment used for industrial purposes, their accessories and thermal calculations and their applications such as (heat exchangers, steam boilers, condensers, evaporators, cooling towers), installation, commissioning, maintenance and faults detection of heat exchangers, expansion joints, humidifiers, dehumidifiers and heaters, industrial furnace systems, uses of furnaces (heating furnaces, heat treatment furnaces, cement furnaces, ceramic and ceramics furnaces, electric furnaces), control and measuring devices of furnaces, heat balance, air and gases systems from thermal systems, valves: typesand use - pipes: types, methods of installation, uses, gases and liquids containers, types and uses, applied examples.

References

2- Compact Heat Exchangers: Selection, Application, Design and Evaluation, Bahman Zohuri, 2016.

3- Heat Transfer Equipment Design, R. K. Shah, EleswarapuChinna, 1988

MEC453 Aerodynamics Engineering (1,2,1)

Nature of aerodynamic forces, Kinematics of air movement, surface friction, Pressure aerodynamic resistance, flow around bodies, airfoils and wings, flow separation, cruise, dimensionless coefficients, principles of aerodynamics, computational methods in aerodynamic, lifting force: wing geometry, lifting aids, maximum lifting coefficient, two dimensional ideal incompressible flow, subsonic and supersonic flow around thin aerodynamic sections, concept of the boundary layer, exact solutions for boundary layer equations in absence or presence of pressure gradient, control of boundary layer, similarity and testing the models.

References

1- Aerodynamics for Engineering Students, E. L. HoughtonP. W. CarpenterSteven H. CollicottDaniel Valentine, 2012
2- The Standard Handbook for Aeronautical and Astronautical Engineers, Mark Davies, 2002
3- Theoretical and Applied Aerodynamics: and Related Numerical Methods J. J. ChattotM. M. Hafez 2015

MEC454 Computational Fluid Mechanics (CFD) (1,2,1)

Introduction, history and philosophy of computational fluid dynamics, CFD as research and design tool, CFD applications in engineering, basics of programming, numerical methods, governing equations in CFD, flow models, continuity equation, momentum equation, energy equation, Navier-Stokes equations for viscous flow, mathematical behavior of partial differential equations, classification of semi-linear partial differential equations, methods of classifications, general behavior of parabolic, elliptic, and hyperbolic equations.

References

1- The Finite Volume Method in Computational Fluid Dynamics, F. MoukalledL. ManganiM. Darwish , 2015 Computational Fluid Dynamics Frederic Magoules, Aug 2011
2- Computational Fluid Dynamics: A Practical Approach, JiyuanTuGuan HengYeohChaoqun Liu 2012
3- Essentials of Computational Fluid Dynamics Jens-Dominik Mueller, Nov 2015

List (3) of Elective Courses

MEC455 Numerical Methods in Energy Science (2,1,0)

Approximate methods to solve equations, Solution of linear and non-linear system of equations, approximate solution using numerical integration, solution of partial differential equations using series, engineering applications, solution by using series, special functions, statistics and probability, continuous and discontinuous random variables, frequency tables, dispersion measures, Multivariable data analysis, numerical solution for linear partial differential equations, basic principles and engineering applications.

References

1- Numerical Methods, for Mathematics, Science, and Engineering, by John H. Mathews, 2nd Edition, Prentice Hall.

2- Lectures on Numerical Analysis, Dennis Deturck and Herbert S. Wilf,

MEC456 Energy Management Systems (2,1,0)

Energy and civilization, Energy resources and reserves, Energy use areas, Energy efficiency and utilization rates, Basic principles of energy conservation and efficient energy use, Fields and methods of energy conservation, energy conservation in Industrial Applications, Field Applications for energy conservation, energy accounting system. Energy equipment in industrial sectors, necessary measurements for evaluation procedures, Methods of measurement, Methods of calculation of efficiency, Methods of assessment of energy equipment, Economics: Alternatives to fuel used, modern trends in selection of equipment for industrial processes, determination of energy consumption and methods of assessment, Calculation of necessary capacity and methods of improvement the performance.

References

1- Building Energy Management Systems: An Application to Heating, Natural Ventilation, Lighting and Occupant Satisfaction, Edition 2 Geoff LevermoreJul 2013
2- Design and Analysis of Distributed Energy Management Systems: Integration of EMS, EV, and ICT , Tatsuya SuzukiShinkichi InagakiYoshihiko SusukiAnh Tuan TranJan 2020
3- Energy Systems and Management Ali NezihiBilgeAyhanÖzgürToyMehmetErdemGünayMar 2015

MEC457 Fire Fighting and Safety Systems (2,1,0)

Fire detection, Thermodynamics of chemical processes and flame propagation, Fire resistance of various materials, Flame dynamics and heat transfer from flame, Fires from electrical appliances, self-ignition of materials inside warehouses and industry, Firefighting, Design of firefighting systems, Explosion prevention methods, Standard specifications and code of practice, Applications.

References

1- Industrial Fire Protection Handbook, R. Craig Schroll, 2002
2- Handbook of Fire and Explosion Protection Engineering Principles: for Oil, Gas, Chemical and Related Facilities, Edition 3 Dennis P. Nolan, May 2014
3- Fundamentals of Fire Protection for the Safety Professional Lon H. FergusonChristopher A. Dr. Janicak, Sep 2005
4- Fire Protection: Detection, Notification, and Suppression, Edition 2 Robert C. TillJ. Walter Coon, Jul 2018

List (4) of Elective Courses

MEC458 Advanced Refrigeration & Air Conditioning (2,1,0)

Design of cold stores, elements and calculations of air conditioning loads, Psychrometric chart and its cycles, Air conditioning systems, Air Duct Design, Smoke extraction systems and stair pressure, Design of chilled water pipelines networks, Selection of valves and accessories, Selection of pumps and fans, Reading diagrams for conditioning and conditioning, Inventory of materials and equipment and classification of works items.

References

1- Refrigeration and Air Conditioning: Edition 3 A. R. TrottT C WelchDec 1999
2- Refrigeration and Air-Conditioning: Edition 4G F HundyA. R. TrottT C Welch, Jun 2008
3- Introduction to Refrigeration and Air Conditioning Systems: Theory and Applications Allan Kirkpatrick, Sep 2017
4- Principles Of Heating, Ventilation And Air Conditioning With Worked Examples Nihal E Wijeysundera, Nov 2015

MEC459 Vehicle Engineering (2,1,0)

General introduction about vehicles, dynamic equations of motion for vehicles, transmission systems, steering systems, suspension systems, ignition systems, cooling system, lubrication systems, exhaust systems, braking systems, basics of electric system, Engine testing and measurements.

References

1- Automobile Engineering Babu A.K. & Singh Ajit PalJan 2013
2- Automotive Chassis Engineering , David C Barton John D Field house Mar 2018
3- Science for Motor Vehicle Engineers, Peter Twigg, Dec 2012
4- A Textbook of Automobile Engineering, Gupta S.K.Jan 2014

UNIVERSITY REQUIREMENTS

GEN0X0 Technical Language (2,0,0)

Characteristics of the English or French or German technical language, grammar review, effective sentences and their characteristics, identify some common mistakes in the writing of technical sentence, paragraph construction, types of paragraphs, development of communication skills by reading and analysis of excerpts from technical writing in various engineering disciplines such as mechanical, electrical , civil ... etc.

References:

1- Mark Hancock & Annie McDonald, English Result - Intermediate Level, Oxford University press, Last Edition .
2- Durrell, Martin, " Using German : a guide to contemporary usage / Martin Durrell", Cambridge, U.K. ; New York : Cambridge University Press, 2003.
3- Coffman Crocker, Mary E, " Schaum's outline of French grammar", McGraw-Hil, Schaum's outline series, 1999, 4th ed.

GEN011 Computer Skills (1,0,1)

IT concepts and terminology, Computer hardware, operating systems, Computer networks, Internet, Computer graphics, Multimedia systems, Databases. Practical applications: Operating system (Microsoft Windows), Word processing (Microsoft Word), Spreadsheets (Microsoft Excel), Microsoft PowerPoint, Databases (Microsoft Access). Introduction to programming concepts, programming languages and their classification, logical design of programs and algorithms, structural programming and object-oriented programming.

References:

1- Practice using ICDL components

GEN012 History of Engineering & Technology (2,0,0)

The definition of science, technology, engineering and architecture. The development of civilizations and their relationship to human sciences (ancient Egyptian civilization, Roman and Greek civilization, Mesopotamia, dark ages, industrial revolution). Different engineering disciplines and their role in society. The historical relationship between science and technology. The relationship between the development of engineering, the social and economic development of the environment, the challenges of globalization and the new economy. The contribution of engineers in the new millennium, the issues of economic and industrial development in Egypt.

References:

1- James E. McClellan & Harold Dorn, Science and Technology in World History: An Introduction, The Johns Hopkins University Press, 2nd. Ed., 2006.
2- Richard Shelton Kirby, Engineering in History, Dover publications, 1990.

GEN900 Communication & Presentation Skills (1,1,0)

General introduction to communication, the importance of communication, types of communication, communication barriers, listening skills, attributes and methods of reading, verbal communication: speaking and writing skills, non-verbal communication, dialogue skills and strategies of persuasion, communication in the work environment, writing CVs, reports and official letters.

References:

1- Gary Johns and Alan M. Saks, Organizational Behavior, Addison Wesley Longman, 2009.
2- Scgermerhorn, Jr., R. J., Hunt, G. J., and Osborn, N. R., Organizational Behavior, John Wiley & Sons, Inc., New York, 10th. Ed., 2008.

GEN902 Human Rights and Combating Corruption (1,1,0)

Human rights: general introduction, definition of human rights, characteristics and principles of human rights, general rules of the idea of human rights, historical development of the idea of human rights, types of human rights, individual rights, collective rights (people's rights), sources of human rights, legal system of rules of protection Human rights, human rights according to the Egyptian constitution in 2014, the duties and obligations of individuals in society. Combating corruption: definition of corruption, its causes, effects and characteristics, types of corruption and its causes, the impact of corruption on human rights and development, the impact of corruption on economic rights and sustainable development, criminal confrontation of corruption.

References:

1- Peter Joseph , The New Human Rights Movement: Reinventing the Economy to End Oppression, Inc. Blackstone Audio: Books, 2017

GEN903 Research and Analysis Skills (1,1,0)

Scientific thinking and its characteristics, definition of scientific research and its characteristics, steps of scientific research (selection of the subject of research, determine the problem of research and selection factors, determine the framework of research, determine the method of research, data analysis), types of scientific studies: exploratory studies, descriptive studies, experimental studies . Methods of scientific research: descriptive approach, social survey, content study, content analysis. Data collection tools: Metrics, observation, interview, questionnaire. Data presentation and analysis methods: Descriptive methods, deductive methods.

References:

1- Gary Johns and Alan M. Saks, Organizational Behavior, Addison Wesley Longman, 2009.
2- Scgermerhorn, Jr., R. J., Hunt, G. J., and Osborn, N. R., Organizational Behavior, John Wiley & Sons, Inc., New York, 10th. Ed., 2008.

GEN901 Theory of Sustainability (1,1,0)

The course aims to introduce students to the concept of sustainability and its feasibility in order to develop its capabilities to reach architectural applications that contribute to achieving the goals of sustainability and its usefulness and to clarify the risks of unsustainable environment. The course deals with the components of the natural environment and the factors of preserving its components and equilibrium, the biological system, cycles and ecological chains, the presence characteristics of natural resources, energy and biological systems. Rapid development of sustainability applications and their comprehensiveness based on modern means of communication and digital technologies.

References:

1- Perspectives for a New Social Theory of Sustainability, Mariella Nocenzi and Alessandra Sannella, Springer Nature Switzerland 2020 .

GEN904 Entrepreneurship (1,1,0)

Concepts in Entrepreneurship, Entrepreneurship and Small Enterprises, Generating Ideas for Entrepreneurial Projects, University and Entrepreneurship Opportunities and Challenges, Marketing Plan, Operational Plan, Financial Plan, Business Plan Writing, Technological Environment of Entrepreneurship, External Business Environment of Entrepreneurial Projects, Support Programs for Leading Projects Egyptian Economy, Entrepreneurial Project Presentation Skills.

References:

1- Entrepreneurship: An Evidence-Based Guide by Robert A Baron Edward Elgar Pub., 2012.

GEN905 Professional Ethics (1,1,0)

The course provides the background needed to discuss the core topics of engineering ethics, with a focus on the ethical issues facing engineers in the areas of engineering work in companies. The course includes the definition of the general elements of the ethics of the profession and the observance of the public interest and regulations and regulations, obligations to the community, the responsibilities of engineers, disclosure of violations, behavior, basic principles and codes of the ABET code of conduct of engineers.

References:

1- William Frey, Professinnal Ethics in Engineering, November, 2013, http://cnx.org/content/col10399/1.4/

GEN908 Contracts and Legislation (1,1,0)

The course aims to provide the student with the technical and legislative knowledge related to the practice of the profession. The study of building legislation, urban planning and the laws governing the practice of the profession and the work systems (engineer / owner / contractor / ...) at the local and international levels as well as studying the methods of contracting/rules and systems for the preparation of integrated implementation documents. Tenders and methods of their examination and evaluation.

References:

1- Randall S. Schuler, Susan E. Jackson, Strategic Human Resoure Management , Wiley, 2nd ed., 2007.

2- Lewicki, J. R., Saunders, M. D., and Barry, B., Essentials of Negotiation, McGraw - Hill, 5th. Ed., 2011.

GEN906 Critical Thinking (1,1,0)

Theoretical concepts (memory, thinking, creativity), an introduction to the thinking skills, the nature of thinking (definition, characteristics, levels), types of thinking (creative, critical, scientific), cognitive thinking skills, meta-cognitive thinking skills, thinking measurement tools, strategies Used in the development of thinking skills, programs to teach thinking skills, methods of teaching thinking skills.

References:

1- Critical Thinking: A Beginner's Guide to Critical Thinking, Better Decision Making and Problem Solving Paperback, by Jennifer Wilson,, Create Space Independent Publishing Platform 2017.

GEN907 Human Resources Management (1,1,0)

Historical development of human resources management, key functions of human resources management, human resources planning, access to human resources, training and development of human resources, compensation of human resources, human resource conservation.

References:

1- Human Resource Management, University of Minnesota Libraries Publishing, 2016

GEN909 Method of Scientific Research and Writing (1,1,0)

The course aims to develop the student's abilities to conduct applied scientific research in one of the fields presented for the graduation project and train to work within a research team, while following the steps of sound scientific research to draw conclusions. The elements and components of scientific research: research problem, scientific method to solve problems and fundamental differences between different scientific research methods, methods of collecting data and statistics necessary for research, methods of examination and analysis of data and information and scientific dealing with variables, formulation of research hypotheses, methods of discussion and examination of hypotheses, drawing conclusions. Scientific method of writing a scientific research (thesis writing). The students select one of the problems in the architectural, urban or any technical field, previously presented as the basis for the graduation project, to conduct the necessary scientific research. Finally, the student is discussed orally through a committee to evaluate the student's performance, within his group, and his findings, studies, analyzes, conclusions and recommendations for the graduation project thesis.

References:

1- Research Methodology and Scientific Writing, by C. George Thomas, Ane Books Pvt. Ltd., 2016

MECHANICAL DESIGN AND PRODUCTION ENGINEERING PROGRAM

Program Information

1. Faculty vision:

The faculty of Engineering at Shoubra, Benha University, aspires to be a pioneering college at the national, regional and international levels in the fields of engineering education, scientific research, innovation and entrepreneurship in order to achieve the goals of sustainable development.

2. Faculty Mission:

The faculty of Engineering at Shoubra is committed to prepare a graduate with competencies and problem-solving skills [1] that qualify each engineer to compete in local and regional labor markets [2], the graduate will be able to innovate and become an entrepreneur [3], the faculty is also committed to the development of engineering sciences [4] and producing internationally distinguished scientific research [5], within the framework of human values and social responsibility [6].

3. Program Vision:

Mechanical Design and Production Engineering Program, faculty of Engineering at Shoubra, aspires to be a pioneering program in education and scientific research in the fields of mechanical design and production engineering at the regional and international levels and to provide an outstanding community service to the community and the surrounding environment.

4. Program Mission:

The Mechanical Design and Production Engineering Program is committed to graduating engineers who are able to accommodate the continuous development in scientific technologies and competition at the local and regional levels [1], equipped with the foundations of basic and applied sciences [2], able to produce innovative solutions to the needs of all sectors of society in the fields of manufacturing engineering and mechanical design [3], and are aware of the ethical and professional values and requirements Environmental protection [4], in addition to developing research and scientific studies and upgrading their quality in line with the needs of society [5].

To judge the compatibility between the program mission and faculty mission, the following matrix is used.

Key Words of Faculty Mission / Key Words of Program Mission	Prepare a graduate with competencies and problem-solving skills [1]	Compete in local and regional labor markets [2]	Innovate and become an entrepreneur [3]	Development of engineering sciences [4]	Producing internationally distinguished scientific research [5]	Human values and social responsibility [6].
Preparing a graduate equipped with knowledge and skills	√		√	√		
Compete in local and regional labor markets		√				
[Innovate and become an entrepreneur			√			
Distinguished community participation	√			√	√	√
Human and moral values						√
Produce scientific research				√	√	√

5. Program Objectives:

The mechanical design and production engineering program aims to:

1. Work with mechanical design and manufacturing systems.
2. Use of mathematics and physics and engineering sciences and systems analysis tools in components and machines design and manufacture to meet the required needs within realistic constraints.
3. Use different instruments appropriately and carry-out experimental design, automatic data acquisition, data analysis, data reduction and interpretation, and data presentation, both orally and in the written form.
4. Use the computer graphics for design, communication, and visualization.
5. Use and/or develop computer software, necessary for the design, manufacturing and management of industrial systems and projects.
6. Analyze multi-disciplinary mechanical, electrical, thermal, and hydraulic systems.
7. Work effectively within multi-disciplinary engineering teams and Lead or supervise a group of designers or technicians and other work.
8. Consider the impacts of engineering solutions on society & environment, and display professional and ethical responsibilities
9. Demonstrate knowledge of contemporary engineering issues, and contextual understanding and engage in self- and life- long learning.

To judge the compatibility of program mission with its objectives, the following matrix is used:

Key Words of Program Mission / Program Objectives	Prepare a graduate with competencies and problem-solving skills	Competition in regional labor markets	Produce scientific research	Distinguished community participation	Human and moral values
Objective #1	√				
Objective #2	√			√	
Objective #3	√				
Objective #4	√				
Objective #5	√		√		
Objective #6	√		√		
Objective #7		√		√	
Objective #8	√			√	√
Objective #9		√	√	√	

6. Graduate Attributes:

1. Master a wide spectrum of engineering knowledge and specialized skills and can apply acquired knowledge using theories and abstract thinking in real life situations.
2. Apply analytic critical and systemic thinking to identify, diagnose and solve engineering problems with a wide range of complexity and variation.
3. Behave professionally and adhere to engineering ethics and standards.
4. Work in and lead a heterogeneous team of professionals from different engineering specialties and assume responsibility for own and team performance
5. Recognize his/her role in promoting the engineering field and contribute in the development of the profession and the community.
6. Value the importance of the environment, both physical and natural, and work to promote sustainability principles.

7. Use techniques, skills and modern engineering tools necessary for engineering practice.
8. Assume full responsibility for own learning and self-development, engage in lifelong learning and demonstrate the capacity to engage in post- graduate and research studies.
9. Communicate effectively using different modes, tools and languages with various audiences; to deal with academic/professional challenges in a critical and creative manner.
10. Demonstrate leadership qualities, business administration and entrepreneurial skills.
11. Use of mathematics and physical and engineering sciences and systems analysis tools in components and machines and produce design and manufacture.
12. Use different instruments appropriately and carry-out experimental design, automatic data acquisition, data analysis, data reduction and interpretation, and data presentation, both orally and in the written form.
13. Use the computer graphics for design, communication, and visualization.
14. Use and/or develop computer software, necessary for the design, manufacturing and management of industrial systems and projects.
15. Analyze multi-disciplinary mechanical, electrical, thermal, and hydraulic systems.

7. Program Competencies:

According to the National Academic Reference Standard, the program in Mechanical Design and Production Engineering must satisfy the following Competencies:

1- General Engineering NARS Competencies in 2018		
Level A (NARS)	A.1	Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.
	A.2	Develop and conduct appropriate experimentation and/or simulation, analyze and interpret data, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.
	A.3	Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the discipline and within the principles and contexts of sustainable design and development.
	A.4	Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.
	A.5	Practice research techniques and methods of investigation as an inherent part of learning.
	A.6	Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.

	A.7	Function efficiently as an individual and as a member of multi-disciplinary and multi- cultural teams.
	A.8	Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.
	A.9	Use creative, innovative and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.
	A.10	Acquire and apply new knowledge; and practice self, lifelong and other learning strategies.

2- Mechanical NARS		
Level B (NARS)	B.1	Model, analyze and design physical systems applicable to the specific discipline by applying the concepts of Thermodynamics, Heat Transfer, Fluid Mechanics, solid Mechanics, Material Processing, Material Properties, Measurements, Instrumentation, Control Theory and Systems, Mechanical Design and Analysis, Dynamics and Vibrations.
	B.2	Plan, manage and carry out designs of mechanical systems and machine elements using appropriate materials both traditional means and computer-aided tools and software contemporary to the mechanical engineering field.
	B.3	Select conventional mechanical equipment according to the required performance.
	B.4	Adopt suitable national and international standards and codes, integrate legal, economic and financial aspects to design, build, operate, inspect and maintain mechanical equipment and systems.

3- Mechanical Design& Production ARS		
Level C (ARS)	C.1	Use basic workshop equipment safely and healthy
	C.2	Plan, prepare and manage processes for manufacturing.
	C.3	Apply quality control and management principles in projects and manufacturing.
	C.4	Prepare, supervise the implementation of engineering drawings, computer graphics and write, present technical reports.

	C.5	Manage design and manufacturing problems, identification, formulation, and solution.
	C.6	Master the ability to carry out development projects independently and in teams.

To judge the compatibility of program objectives with its competencies, the following matrix is used:

Program Objectives	Program Competencies																			
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6
Objective #1	√								√		√				√					
Objective #2				√		√						√		√			√		√	
Objective #3			√			√														
Objective #4																		√		
Objective #5		√																		√
Objective #6	√				√								√			√				
Objective #7							√	√								√				√
Objective #8			√																	
Objective #9						√				√										

PROGRAM REQUIREMENTS

Mechanical Design and Production Engineering Program Requirements

#	Requirements	Contact Hours	%	% according to reference framework
1	Humanities & Social Science	20	8	8-12
2	Mathematics & Basic Sciences	64	25.6	20-26
3	Basic Engineering Science	67	26.8	25-30
4	Applied Engineering and Design	71	28.4	25-30
5	Business Administration	11	4.4	2-4
6	Engineering Knowledge	7	2.8	3-6
7	Projects &Training	10	4	3-6
		250	100	100

#	Subjects	Contact Hours	%	Min. Percentage according to reference framework (%)
1	University Requirements	20	8	8
2	Faculty Requirements	70	28	20
3	Major Specialization Subjects	98	39.2	35
4	Minor Specialization Subjects	62	24.8	Maximum 30
		250	100	

LIST OF COURSES MECHANICAL DESIGN AND PRODUCTION ENGINEERING PROGRAM

No.	Code	Course	Contact Hrs				Credit Hours
			Lec.	Tut.	Lab.	Total	
University Requirements (12+7+1=20 Contact Hours) = (12 Credit Hours)							
1	GEN0x0	Elective - Language requirements List	2	0	0	2	2
2	GEN011	Computer Skills	1	0	1	2	1
3	GEN012	History of Engineering & Technology	2	0	0	2	2
4	GEN9xx	Elective - University Requirements list	1	1	0	2	1
5	GEN9xx	Elective - University Requirements list	1	1	0	2	1
6	GEN9xx	Elective - University Requirements list	1	1	0	2	1
7	GEN9xx	Elective - University Requirements list	1	1	0	2	1
8	GEN9xx	Elective - University Requirements list	1	1	0	2	1
9	GEN9xx	Elective - University Requirements list	1	1	0	2	1
10	GEN9xx	Elective - University Requirements list	1	1	0	2	1
Faculty Requirements (22+ 22+26 =70 Contact Hours) = (40 Credit Hours)							
1	BAS010	Differential Calculus and Algebra	2	2	0	4	3
2	BAS011	Statics	2	1	2	5	3
3	BAS012	Engineering Chemistry	2	1	2	5	3
4	BAS013	Physics of Materials & Electricity	2	1	3	6	3
5	MEC010	Engineering Drawing (1)	0	3	0	3	1
6	BAS014	Integral Calculus & Analytical Geometry	2	2	0	4	3
7	BAS015	Dynamics	2	1	2	5	3
8	BAS016	Physics of Light, Heat and Magnetism	2	1	2	5	3
9	MEC011	Principles of Manufacturing Engineering	1	0	2	3	2
10	MEC012	Engineering Drawing (2)	0	3	1	4	2
11	MEC113	Mechanics & Testing of Materials	2	1	2	5	3
12	MEC210	Engineering Economy & Accounting	2	2	0	4	3
13	MEC310	Engineering Project Management	2	2	0	4	3
14	MEC414	Feasibility Study of Engineering Projects	1	2	0	3	2
15	MEC490	Graduation Project	0	0	10	10	3
16	MEC100	Summer Training	0	0	0	0	0
17	MEC200	Field Training (1)	0	0	0	0	0
18	MEC300	Field Training (2)	0	0	0	0	0
Major Specialization Subjects (39+36+23=98 Contact Hours) = (62 Credit Hours)							
1	MEC110	Mechanical Drawing	1	3	0	4	2
2	ELE170	Electrical Engineering	2	2	0	4	3
3	MEC111	Materials Science	1	1	3	5	2
4	BAS110	Statistics & Theory of Probability	2	2	0	4	3
5	BAS111	Engineering Mechanics	1	3	0	4	2
6	MEC112	Manufacturing Technology (1)	2	1	1	4	3
7	MEC120	Thermodynamics	2	2	1	5	3
8	BAS112	Differential Equations	2	2	0	4	3

9	MEC121	Fluid Mechanics (1)	2	1	2	5	3
10	MEC102	Engineering Mathematics Using Computer	1	0	3	4	2
11	MEC201	Theory of Measurements & Sensors	1	1	3	5	2
12	BAS211	Numerical Analysis	2	2	0	4	3
13	MEC211	Kinematics & Dynamics of Rigid Bodies	2	2	1	5	3
14	MEC212	Manufacturing Technology (2)	2	1	2	5	3
15	MEC213	Mechanical Design (1)	2	4	0	6	4
16	MEC220	Heat Transfer	2	1	2	5	3
17	MEC214	Mechanical Vibrations	2	2	0	4	3
18	ELE270	Electrical Machines	2	1	1	4	3
19	MEC221	Fluid Mechanics (2)	2	1	1	4	3
20	MEC320	Hydraulic & Pneumatic Systems	2	0	3	5	3
21	MEC330	System Dynamics	2	2	0	4	3
22	MEC331	Automatic Control	2	2	0	4	3
Minor Specialization Subjects (23+19+20=62 Contact Hours) = (37 Credit Hours)							
1	MEC311	Mechanical Design (2)	2	2	0	4	3
2	MEC312	Theory of Metal Cutting	2	2	2	6	4
3	MEC313	Theory of Metal Forming	2	2	0	4	3
4	MEC314	Advanced Engineering Materials	1	2	2	5	3
5	MEC316	Quality Control	2	2	0	4	3
6	MEC318	Computer Aided Design (CAD)	2	0	4	6	3
7	MEC410	Selection of Materials for Mechanical Design	2	2	1	5	3
8	MEC411	Computer Aided Manufacturing (CAM)	1	0	4	5	2
9	MEC413	Manufacturing Technology (3)	2	1	2	5	3
10	MEC415	Design of Production Aids	1	0	3	4	2
11	MEC4xx	Elective (1)	1	2	1	4	2
12	MEC4xx	Elective (2)	1	2	1	4	2
13	MEC4xx	Elective (3)	2	1	0	3	2
14	MEC4xx	Elective (4)	2	1	0	3	2

COURSES CLASSIFICATION
MECHANICAL DESIGN AND PRODUCTION ENGINEERING PROGRAM

No.	Code	Course	Contact Hrs			
			Lec.	Tut.	Lab.	Total
Humanities & Social Science Subjects (12+7+1=20 Contact Hours)						
1	GEN0x0	Elective - Language requirements List	2	0	0	2
2	GEN011	Computer Skills	1	0	1	2
3	GEN012	History of Engineering & Technology	2	0	0	2
4	GEN9xx	Elective - University Requirements list	1	1	0	2
5	GEN9xx	Elective - University Requirements list	1	1	0	2
6	GEN9xx	Elective - University Requirements list	1	1	0	2
7	GEN9xx	Elective - University Requirements list	1	1	0	2
8	GEN9xx	Elective - University Requirements list	1	1	0	2
9	GEN9xx	Elective - University Requirements list	1	1	0	2
10	GEN9xx	Elective - University Requirements list	1	1	0	2
Mathematics & Basic Sciences (25+21+18=64 Contact Hours)						
1	BAS010	Differential Calculus and Algebra	2	2	0	4
2	BAS011	Statics	2	1	2	5
3	BAS012	Engineering Chemistry	2	1	2	5
4	BAS013	Physics of Materials & Electricity	2	1	3	6
5	BAS014	Integral Calculus & Analytical Geometry	2	2	0	4
6	BAS015	Dynamics	2	1	2	5
7	BAS016	Physics of Light, Heat and Magnetism	2	1	2	5
8	BAS110	Statistics & Theory of Probability	2	2	0	4
9	BAS111	Engineering Mechanics	1	3	0	4
10	BAS112	Differential Equations	2	2	0	4
11	BAS211	Numerical & Complex Analysis	2	2	0	4
12	MEC111	Materials Science	1	1	3	5
13	MEC102	Engineering Mathematics Using Computer	1	0	3	4
14	MEC211	Kinematics & Dynamics of Rigid Bodies	2	2	1	5
Business Administration (5+6+0=11 Contact Hours)						
1	MEC210	Engineering Economy & Accounting	2	2	0	4
2	MEC310	Engineering Project Management	2	2	0	4
3	MEC414	Feasibility Study of Engineering Projects	1	2	0	3
Engineering Knowledge Subjects (3+2+2=7 Contact Hours)						
1	MEC011	Principles of Manufacturing Engineering	1	0	2	3
2	ELE170	Electrical Engineering	2	2	0	4
Basic Engineering Science Subjects (23+27+17=67 Contact Hours)						
1	MEC010	Engineering Drawing (1)	0	3	0	3
2	MEC012	Engineering Drawing (2)	0	3	1	4
3	MEC110	Mechanical Drawing	1	3	0	4
4	MEC113	Mechanics & Testing of Materials	2	1	2	5
5	MEC120	Thermodynamics	2	2	1	5
6	MEC121	Fluid Mechanics (1)	2	1	2	5
7	MEC201	Theory of Measurements & Sensors	1	1	3	5
8	MEC220	Heat Transfer	2	1	2	5

9	MEC214	Mechanical Vibrations	2	2	0	4
10	ELE270	Electrical Machines	2	1	1	4
11	MEC221	Fluid Mechanics (2)	2	1	1	4
12	MEC330	System Dynamics	2	2	0	4
13	MEC312	Theory of Metal Cutting	2	2	2	6
14	MEC313	Theory of Metal Forming	2	2	0	4
15	MEC314	Advanced Engineering Materials	1	2	2	5
Applied Engineering and Design Subjects (28+21+22=71 Contact Hours)						
1	MEC112	Manufacturing Technology (1)	2	1	1	4
2	MEC212	Manufacturing Technology (2)	2	1	2	5
3	MEC213	Mechanical Design (1)	2	4	0	6
4	MEC331	Automatic Control	2	2	0	4
5	MEC311	Mechanical Design (2)	2	2	0	4
6	MEC316	Quality Control	2	2	0	4
7	MEC318	Computer Aided Design (CAD)	2	0	4	6
8	MEC320	Hydraulic & Pneumatic Systems	2	0	3	5
9	MEC410	Selection of Materials for Mechanical Design	2	2	1	5
10	MEC411	Computer Aided Manufacturing (CAM)	1	0	4	5
11	MEC413	Manufacturing Technology (3)	2	1	2	5
12	MEC415	Design of Production Aids	1	0	3	4
13	MEC4xx	Elective (1)	1	2	1	4
14	MEC4xx	Elective (2)	1	2	1	4
15	MEC4xx	Elective (3)	2	1	0	3
16	MEC4xx	Elective (4)	2	1	0	3
Projects and Field Training Subjects (0+0+10=10 Contact Hours)						
2	MEC490	Graduation Project	0	0	10	10
3	MEC100	Summer Training	0	0	0	0
4	MEC200	Field Training (1)	0	0	0	0
5	MEC300	Field Training (2)	0	0	0	0

STUDY PLANS FOR MECHANICAL DESIGN AND PRODUCTION ENGINEERING PROGRAM

PREPARATORY YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
BAS010	Differential Calculus and Algebra	2	2	0	4	60	0	60	120	3
BAS011	Statics	2	1	2	5	45	30	75	150	3
BAS012	Engineering Chemistry	2	1	2	5	45	30	75	150	3
BAS013	Physics of Materials & Electricity	2	1	3	6	45	45	90	180	3
MEC010	Engineering Drawing (1) ×	0	3	0	3	25	20	60	90	3
GEN0x0	Elective - Language requirements List	2	0	0	2	30	0	30	60	2
		10	**8**	**7**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
BAS014	Integral Calculus & Analytical Geometry	2	2	0	4	60	0	60	120	3
BAS015	Dynamics	2	1	2	5	45	30	75	150	3
BAS016	Physics of Light, Heat and Magnetism	2	1	2	5	45	30	75	150	3
MEC011	Principles of Manufacturing Engineering†	1	0	2	3	25	20	45	90	3
MEC012	Engineering Drawing (2) ×	0	3	1	4	30	30	60	120	3
GEN011	Computer Skills ×	1	0	1	2	15	15	30	60	2
GEN012	History of Engineering & Technology	2	0	0	2	30	0	30	60	2
		10	**7**	**8**	**25**				**750**	

† In workshops, students are divided into groups 15 students/each, and a faculty stuff member (or an assistant) as well as a practical trainer will teach the group.

× In exercises, students are divided into groups 15 students/each. Two faculty stuff members or their assistants will teach each group.

FIRST YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
MEC110	Mechanical Drawing *×	1	3	0	4	60	0	60	120	4
ELE170	Electrical Engineering	2	2	0	4	60	0	60	120	3
MEC111	Materials Science	1	1	3	5	45	30	75	150	3
BAS110	Statistics & Theory of Probability	2	2	0	4	60	0	60	120	3
BAS111	Engineering Mechanics	1	3	0	4	60	0	60	120	3
MEC112	Manufacturing Technology (1)†	2	1	1	4	30	30	60	120	3
		9	**12**	**4**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
MEC120	Thermodynamics	2	2	1	5	45	30	75	150	3
BAS112	Differential Equations	2	2	0	4	60	0	60	120	3
MEC121	Fluid Mechanics (1)	2	1	2	5	45	30	75	150	3
MEC113	Mechanics & Testing of Materials	2	1	2	5	45	30	75	150	3
MEC102	Computer Aided Engineering Mathematics	1	0	3	4	30	30	60	120	3
GEN9XX	Elective from University Requirements list	1	1	0	2	20	10	30	60	2
		10	**7**	**8**	**25**				**750**	

* Prior to registering in first year, the student should have completed 3 weeks of summer training in “Computer aided mechanical drawing” (MEC100) for 3 weeks in summer for 5 days per week. The daily training is for 5 hours (2 hrs Lecture + 3 hrs tutorial), amounting to a total of 25 hours per week. A maximum grade of 25 marks is added to the 'semester work' grades of the “mechanical drawing” course (MEC110).

× In exercises, students are divided into groups 15 students/each.Two faculty stuff members or teaching assistants teach each group.

† In workshops, students are divided into groups 15 students/each, and a faculty stuff member (or teaching assistants) as well as a practical trainer will teach the group.

*After completing the second year, the student undergoes field training -1 (MEC300) for 4 weeks during the summer vacation, in a factory, company, firm or project site …etc in a related field. Every 5 students are supervised by a staff member of the department, (this supervision is not included in the staff member's teaching load).

SECOND YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
MEC210	Engineering Economy & Accounting	2	2	0	4	60	0	60	120	3
MEC201	Theory of Measurements & Sensors	1	1	3	5	45	30	75	150	3
BAS211	Numerical & Complex Analysis	2	2	0	4	60	0	60	120	3
MEC211	Kinematics & Dynamics of Rigid Bodies	2	2	1	5	45	30	75	150	3
MEC212	Manufacturing Technology (2)†	2	1	2	5	45	30	75	150	3
GEN9XX	Elective from University Requirements list	1	1	0	2	20	10	30	60	2
		11	**8**	**6**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
MEC213	Mechanical Design (1)	2	4	0	6	60	30	90	180	4
MEC220	Heat Transfer	2	1	2	5	45	30	75	150	3
MEC214	Mechanical Vibrations	2	2	0	4	60	0	60	120	3
ELE270	Electrical Machines	2	1	1	4	40	20	60	120	3
MEC221	Fluid Mechanics (2)	2	1	1	4	40	20	60	120	3
GEN9XX	Elective from University Requirements list	1	1	0	2	20	10	30	60	2
		11	**10**	**4**	**25**				**750**	

† In workshops, students are divided into groups 15 students/each, and a faculty stuff member (or teachingassistant) as well as a practical trainer teach the group.

*After completing the second year, the student undergoes field training -1 (MEC300) for 4 weeks during the summer vacation, in a factory, company, firm or project site …etc in a related field. Every 5 students are supervised by a staff member of the department, (this supervision is not included in the staff member's teaching load).

THIRD YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
MEC310	Engineering Project Management	2	2	0	4	60	0	60	120	3
MEC320	Hydraulic & Pneumatic Systems	2	0	3	5	45	30	75	150	3
MEC330	System Dynamics	2	2	0	4	60	0	60	120	3
MEC311	Mechanical Design (2)	2	2	0	4	35	25	60	120	4
MEC312	Theory of Metal Cutting	2	2	2	6	45	30	75	150	3
GEN9XX	Elective from University Requirements list	1	1	0	2	20	10	30	60	2
MEC300	Field Training (1) *	0	0	0	0	15	15	0	30	-
		12	**8**	**5**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
MEC331	Automatic Control	2	2	0	4	60	0	60	120	3
MEC314	Advanced Engineering Materials	1	2	2	5	45	30	75	150	3
MEC313	Theory of Metal Forming	2	2	0	4	60	0	60	120	3
MEC316	Quality Control	2	2	0	4	60	0	60	120	3
MEC318	Computer Aided Design (CAD)	2	0	4	6	60	30	90	180	3
GEN9XX	Elective from University Requirements list	1	1	0	2	20	10	30	60	2
		11	**8**	**6**	**25**				**750**	

* After completing the third year, the student undergoes field training -2 (mec 400) for 4 weeks during the summer vacation, in a factory, company, firm or project site …etc in a related field. Every 5 students are supervised by a staff member of the department, (this supervision is not included in the staff member's teaching load).

FOURTH YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
MEC410	Selec. of Mat. for Mech. Design	2	2	1	5	40	30	70	140	3
MEC411	Comp. Aided Manufacturing (CAM)	1	0	4	5	40	30	70	140	3
MEC413	Manufacturing Technology (3)†	2	1	2	5	40	30	70	140	3
MEC4xx	Elective (1)	1	2	1	4	30	30	60	120	3
MEC4xx	Elective (2)	1	2	1	4	30	30	60	120	3
GEN9XX	Elective from University Requirements list	1	1	0	2	20	10	30	60	2
MEC400	Field Training (2)	0	0	0	0	15	15	0	30	-
		8	**8**	**9**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
MEC414	Feasibility Study of Eng. Projects	1	2	0	3	45	0	45	90	3
MEC415	Design of Production Aids	1	0	3	4	30	30	60	120	3
MEC4xx	Elective (3)	2	1	0	3	45	0	45	90	3
MEC4xx	Elective (4)	2	1	0	3	45	0	45	90	3
GEN9XX	Elective from University Requirements list	1	1	0	2	20	10	30	60	2
MEC490	Graduation Project *	0	0	10	10	180	120	0	300	-
		8	**4**	**13**	**25**				**750**	

† In workshops, students are divided into groups 15 students/each, and a faculty stuff member (or teaching assistant) as well as a practical trainer will teach the group.

* After completing the second semester, the students are divided into groups and continue performing the graduation project for 4 weeks.

LIST OF TECHNICAL LANGUAGES ELECTIVE COURSES

#	Code	Contact Hours	Contact Hrs			
			Lec.	Tut.	Lab.	Total
1	GEN010	English Language	2	0	0	2
2	GEN020	German Language	2	0	0	2
3	GEN030	French Language	2	0	0	2

LIST OF ELECTIVE COURSES FROM UNIVERSITY REQUIREMENTS

#	Code	Contact Hours	Contact Hrs			
			Lec.	Tut.	Lab.	Total
1	GEN900	Communication & Presentation Skills	1	1	0	2
2	GEN901	Theory of Sustainability	1	1	0	2
3	GEN902	Human Rights and Combating Corruption	1	1	0	2
4	GEN903	Research & Analysis Skills	1	1	0	2
5	GEN904	Entrepreneurship	1	1	0	2
6	GEN905	Professional Ethics	1	1	0	2
7	GEN906	Critical Thinking	1	1	0	2
8	GEN907	Human Resources Management	1	1	0	2
9	GEN908	Contracts and Legislation	1	1	0	2
10	GEN909	Method of Scientific Research and Writing	1	1	0	2

LIST OF ELECTIVE COURSES FOR MECHANICAL DESIGN & PRODUCTION ENGINEERING PROGRAM

#	Code	Contact Hours	Contact Hrs			
			Lec.	Tut.	Lab.	Total
List (1) of Elective Courses						
1	MEC440	Surface & Heat Treatments of Metals	1	2	1	4
2	MEC441	Welding Technology & Metallurgy	1	2	1	4
3	MEC442	Fracture Mechanics & Failure Analysis	1	2	1	4
List (2) of Elective Courses						
1	MEC443	Finite Element Method	1	2	1	4
2	MEC444	Die Design	1	2	1	4
3	MEC445	Reverse Engineering	1	2	1	4
List (3) of Elective Courses						
1	MEC446	Design Optimization	2	1	0	3
2	MEC447	Lean Manufacturing Systems	2	1	0	3
List (4) of Elective Courses						
1	MEC448	Maintenance and Monitoring of Machines Using Mechanical Vibration	2	1	0	3
2	MEC449	Design of machining and forming machines	2	1	0	3

MECHANICAL DESIGN & PRODUCTION ENGINEERING PROGRAM TREE

	List (1) of Elective Courses	List (2) of Elective Courses	List (3) of Elective Courses	List (4) of Elective Courses

Elective Courses	MEC440 **Surface & Heat Treatments of Metals**	MEC441 **Welding Technology & Metallurgy**	MEC442 **Fracture Mechanics & Failure Analysis**	MEC443 **Finite Element Method**	MEC444 **Die Design**	MEC445 **Reverse Engineering**	MEC446 **Design Optimization**	MEC447 **Lean Manufacturing Systems**	MEC448 **Maintenance and Monitoring of Machines Using Mechanical Vibration**	MEC449 **Machine Tool Design**
Prerequisite	MEC314 **Advanced Engineering Materials**	MEC413 **Manufacturing Technology (3)**			MEC318 **Computer Aided Design (CAD)**	MEC318 **Computer Aided Design (CAD)**		MEC411 **Comp. Aided Manufacturing (CAM)**		MEC415 **Design of Production Aids**

FOURTH YEAR	MEC410 **Selec. of Mat. for Mech. Design**	MEC411 **Comp. Aided Manufacturing (CAM)**	MEC413 **Manufacturing Technology (3)**	MEC4xx **Elective (1)**	MEC4xx **Elective (2)**	GEN9XX Elective GEN	MEC414 **Feasibility Study of Eng. Projects**	MEC415 **Design of Production Aids**	MEC4xx **Elective (3)**	MEC4xx **Elective (4)**	GEN9XX Elective GEN	MEC490 **Graduation Project ***
Prerequisite	MEC311 **Mechanical Design (2)**	MEC318 **Computer Aided Design (CAD)**	MEC212 **Manufacturing Technology (2**				MEC310 **Engineering ProjectMan agement**	MEC318 **Computer Aided Design (CAD)**				

THIRD YEAR	MEC310 **Engineering ProjectMana gement**	MEC320 **Hydraulic & Pneumatic Systems**	MEC330 **System Dynamics**	MEC311 **Mechanical Design (2)**	MEC312 **Theory of Metal Cutting**	GEN9XX Elective GEN	MEC300 **Field Training (2)**	MEC331 **Automatic Control**	MEC314 **Advanced Engineering Materials**	MEC313 **Theory of Metal Forming**	MEC316 **Quality Control**	MEC318 **Computer Aided Design (CAD)**	GEN9XX Elective GEN

Prerequisite	MEC210 **Engineering Economy & Accounting**	MEC221 **Fluid Mechanics (2)**	MEC214 **Mechanical Vibrations**	MEC213 **Mechanical Design (1)**	MEC212 **Manufacturing Technology (2)**			MEC330 **System Dynamics**	MEC111 **Materials Science**	MEC212 **Manufacturing Technology (2)**	BAS110 **Statistics & Theory of Probability**	MEC311 **Mechanical Design (2)**	
SECOND YEAR	MEC210 **Engineering Economy & Accounting**	MEC201 **Theory of Measurements & Sensors**	BAS211 **Numerical & Complex Analysis**	MEC211 **Kinematics & Dynamics of Rigid Bodies**	MEC212 **Manufacturing Technology (2)**	GEN9XX Elective GEN	MEC200 **Field Training (1)**	MEC213 **Mechanical Design (1)**	MEC220 **Heat Transfer**	MEC214 **Mechanical Vibrations**	ELE270 **Electrical Machines**	MEC221 **Fluid Mechanics (2)**	GEN9XX Elective GEN
Prerequisite		MEC201 **Theory of Measurements & Sensors**	BAS112 **Differential Equations**	MEC211 **Kinematics & Dynamics of Rigid Bodies**	MEC112 **Manufacturing Technology (1)**	GEN9XX Elective GEN	MEC200 **Field Training (1)**	MEC113 **Mechanics & Testing of Materials**	MEC120 **Thermodynamics**	BAS111 **Engineering Mechanics**	ELE170 **Electrical Engineering**	MEC121 **Fluid Mechanics (1)**	

FIRST YEAR	MEC110 **Mechanical Drawing**	ELE170 **Electrical Engineering**	MEC111 **Materials Science**	BAS110 **Statistics & Theory of Probability**	BAS111 **Engineering Mechanics**	MEC112 **Manufacturing Technology (1)**	MEC120 **Thermodynamics**	BAS112 **Differential Equations**	MEC121 **Fluid Mechanics (1)**	MEC113 **Mechanics & Testing of Materials**	MEC102 **Engineering Mathematics Using Computer**	GEN9XX Elective GEN
Prerequisite	MEC012 **Engineering Drawing (2) ×**	BAS013 **Physics of Materials & Electricity**	MEC111 **Materials Science**		BAS011 **Statics** BAS014 **Dynamics**	MEC011 **Principles of Man. Technology**	BAS016 **Physics of Light, Heat and Magnetism**	BAS014 **Integral Calculus & Analytical Geometry**	BAS013 **Physics of Materials & Electricity**	MEC111 **Materials Science** BAS111 **Engineering Mechanics**	GEN011 **Computer Skills ×**	

PREPARATORY YEAR	BAS010 **Differential Calculus and Algebra**	BAS011 **Statics**	BAS012 **Engineering Chemistry**	BAS013 **Physics of Materials & Electricity**	MEC010 **Engineering Drawing (1) ×**	GEN010 **Technical Language**	BAS014 **Integral Calculus & Analytical Geometry**	BAS014 **Dynamics**	BAS016 **Physics of Light, Heat and Magnetism**	MEC011 **Principles of Manufacturing Engineering**	MEC012 **Engineering Drawing (2) ×**	GEN011 **Computer Skills ×**	GEN012 **History of Engineering & Technology**

Prerequisite							BAS010 **Differential Calculus and Algebra**	BAS011 **Statics**	BAS013 **Physics of Materials & Electricity**		MEC010 **Engineering Drawing (1) ×**		

Matrix relating the program courses with competencies

Course Code	Course Name	Engineering Competencies (2018)										“Department” Mechanical Engineering Competencies (NARS)				“Discipline” Mechanical Power Engineering Competencies (ARS)					
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6
BAS010	Differential Calculus and Algebra	√							√	√											
BAS011	Statics	√							√	√											
BAS012	Engineering Chemistry	√							√	√											
BAS013	Physics of Materials & Electricity	√							√	√											
MEC010	Engineering Drawing (1) ×			√					√		√					√					
GEN010	Technical Language			√				√	√												
BAS014	Integral Calculus & Analytical Geometry	√							√												
BAS015	Dynamics	√							√												
BAS016	Physics of Light, Heat and Magnetism	√							√												
MEC011	Principles of Manufacturing Engineering†		√	√	√							√	√								
MEC012	Engineering Drawing (2) ×			√					√		√					√					

Course Code	Course Name	Engineering Competencies (2018)										"Department" Mechanical Engineering Competencies (NARS)				"Discipline" Mechanical Power Engineering Competencies (ARS)					
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6
GEN011	Computer Skills ×	√			√				√												
GEN012	History of Engineering & Technology	√		√					√	√											
MEC110	Mechanical Drawing *×	√		√							√	√	√		√						
ELE170	Electrical Engineering						√					√				√					
MEC111	Materials Science				√			√					√								
BAS110	Statistics & Theory of Probability	√				√	√	√			√	√				√	√	√			
BAS111	Engineering Mechanics		√				√	√			√	√									
MEC112	Manufacturing Technology (1)†							√						√	√	√					
MEC120	Thermodynamics		√	√								√	√								
BAS112	Differential Equations	√				√	√	√			√										
MEC121	Fluid Mechanics (1)							√	√			√	√								
MEC113	Mechanics & Testing of Materials		√		√							√									
MEC102	Engineering Mathematics Using Computer	√				√	√	√			√						√				
GEN900	Communication & Presentation Skills			√			√					√					√			√	
MEC210	Engineering Economy & Accounting			√			√					√					√			√	
MEC201	Theory of Measurements & Sensors			√										√		√			√		
BAS211	Numerical & Complex		√	√								√				√		√	√		

Course Code	Course Name	Engineering Competencies (2018)										"Department" Mechanical Engineering Competencies (NARS)				"Discipline" Mechanical Power Engineering Competencies (ARS)					
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6
	Analysis																				
MEC211	Kinematics & Dynamics of Rigid Bodies				√								√			√	√				
MEC212	Manufacturing Technology (2)†						√						√				√				
GEN902	Human Rights and Combating Corruption								√	√	√										
MEC213	Mechanical Design (1)	√										√	√				√			√	
MEC220	Heat Transfer				√								√			√	√				
MEC214	Mechanical Vibrations				√								√			√	√				
ELE270	Electrical Machines						√					√				√					
MEC221	Fluid Mechanics (2)							√	√			√	√								
GEN903	Research & Analysis Skills		√											√			√	√			
MEC310	Engineering Project Management		√		√										√		√				
MEC320	Hydraulic & Pneumatic Systems									√	√		√	√		√					
MEC330	System Dynamics				√								√			√	√				
MEC311	Mechanical Design (2)				√									√	√				√		
MEC312	Theory of Metal Cutting			√								√				√	√				√
GEN310	Entrepreneurship							√	√	√	√										
MEC300	Field Training (1)*		√						√	√				√				√			
MEC331	Automatic Control						√						√		√					√	√

Course Code	Course Name	Engineering Competencies (2018)										"Department" Mechanical Engineering Competencies (NARS)				"Discipline" Mechanical Power Engineering Competencies (ARS)					
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6
MEC314	Advanced Engineering Materials		√				√						√			√	√		√		
MEC313	Theory of Metal Forming																				√
MEC316	Quality Control		√		√										√		√				
MEC318	Computer Aided Design (CAD)		√	√									√					√			√
GEN905	Professional Ethics							√	√												
MEC410	Selec. of Mat. for Mech. Design			√	√								√				√				
MEC411	Comp. Aided Manufacturing (CAM)		√										√		√			√		√	
MEC413	Manufacturing Technology (3)†						√						√				√				
MEC4xx	Elective (1)					√						√				√	√				
MEC4xx	Elective (2)		√	√								√				√		√	√		
GEN410	Critical Thinking		√						√	√			√								
MEC400	Field Training (2)*		√						√	√				√				√			
MEC414	Feasibility Study of Eng. Projects							√				√				√					
MEC415	Design of Production Aids			√			√							√				√	√		
MEC4xx	Elective (3)		√				√						√								
MEC4xx	Elective (4)		√					√				√				√					
GEN907	Human Resources Management				√	√	√		√	√	√							√	√	√	

Course Code	Course Name	Engineering Competencies (2018)										"Department" Mechanical Engineering Competencies (NARS)				"Discipline" Mechanical Power Engineering Competencies (ARS)					
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6
MEC490	Graduation Project *		√						√	√				√				√			
Elective																					
MEC440	Surface & Heat Treatments of Metals		√				√					√									
MEC441	Welding Technology & Metallurgy		√				√						√				√				
MEC442	Fracture Mechanics & Failure Analysis								√		√		√	√		√					
MEC443	Finite Element Method				√	√							√				√				
MEC444	Die Design			√	√								√				√				
MEC445	Reverse Engineering		√				√					√					√	√			
MEC446	Design Optimization		√				√					√					√	√			
MEC447	Lean Manufacturing Systems			√										√		√			√		
MEC448	Maintenance and Monitoring of Machines Using Mechanical Vibration						√		√						√				√		
MEC449	Machine Tool Design			√									√		√			√			

Courses Description

PREPARATORY YEAR

BAS010 Differential Calculus and Algebra (2,2,0)

Differentiation: Elementary functions, Polynomials, Exponential, Logarithmic and trigonometric functions, Limits and continuity, Derivative, Implicit differentiation, Maximum and minimum values, Mean value theorem, Taylor's expansion, Integration ofPolynomials, Exponential and trigonometric functions, Definite integral.

Algebra: Matrices, Algebra of matrices, Eigenvalues and eigenvectors, Positive and negative matrices, Linear systems, Finite series, Complex numbers, Mathematical induction.

References:

1- Basic Technical Mathematics with Calculus Kindle Edition, Pearson; 11th Edition, 2017.
2- Textbook of Basic Mathematics: A Begginer's Guide To Geometry, Trigonometry and Calculus Kindle Edition,, 2017.

BAS011 Statics (2,1,2)

Application on space vectors, resultant of a set of forces, moments, equivalent couple moment, equations of equilibrium for rigid body, types of supports, statically determinate beams and trusses, equilibrium under influence of spatial forces and couples, center of mass (for particles and planer surface), moment of inertia (parallel axes, major axes, planer surface).

References:

1- Engineering Mechanics: Statics & Dynamics by Russell Hibbeler, Pearson; 14th Edition, 2015.

BAS012 Engineering Chemistry (2,1,2)

Gaseous state (gases law), chemical equilibrium and Le Chatellier, principle –solutions- phase diagram- basics of water treatment and desalination technology- Introduction on thermo chemistry and its rules,basics of fuel combustion, calorimetric and determination of heat of combustion –Electrochemistry and conduction in electrolytic solutions Electrochemical cells and Nernst equation- Corrosion of metals (types,methods of prevention of corrosion – ionic equilibrium and pH calculation- building materials and some petrochemicals industry.

References:

1- Engineering Chemistry: Alpha Science; Illustrated Edition, 2018

BAS013 Physics of Materials & Electricity (2,1,3)

Properties of matter : Physical quantities, standard units and dimensions, atomic structure (electronic distribution, classification of elements and energy levels), crystalline structure (crystalline grid, symmetry, vacuum groups, some simple examples of crystalline structure), stress and strain, mechanical properties of materials (tensile strength and yield stress, etc.,) Physical properties of liquids, viscosity, surface tension, Archimedes principles, Pascal's law, Bernoulli's equation and their applications. Laboratory experiments. Electrical: charge and matter, Coulomb's law, electric field, Gauss's law, electric potential, capacitors and dielectric materials, electrical resistance and electromotive force, Ohm's law, simple electrical circuit, laboratory experiments.

References:

1- Modern Classical Physics: Optics, Fluids, Plasmas, Elasticity, Relativity, and Statistical Physicsby Kip S. Thorne , Princeton University Press, 2017.
2- Basic Physics: A Self-Teaching Guide by K Kuhn, Noah Books, 2018

BAS014 Integral Calculus and Analytical Geometry (2,2,0)

Integration: Hyperbolic functions and inverse functions and their derivatives, derivatives of parametric relations, Methods of integrations, integration by partial fractions, parts, reduction and substitution, Applications of definite integrals for obtaining plane area, volumes, arc length and surface area.

Analytical geometry: Cartesian and polar coordinates, Equation of pair of lines, Equation of circle, Conic sections and their properties, Equation of plane, Equations of sphere, cone and cylinder.

References:

1- Basic Technical Mathematics with Calculus Kindle Edition, Pearson; 11th Edition, 2017.
2- Textbook of Basic Mathematics: A Begginer's Guide To Geometry, Trigonometry and Calculus Kindle Edition,, 2017.

BAS015 Dynamics (2,1,2)

Kinematics of Particle (rectilinear and curvilinear motion, Cartesian coordinates, projectile motion, natural coordinates, polar coordinates, relative motion), kinetics of Particle (acceleration force method), plane kinematics of rigid bodies (translational and rotational motion, general motion: relative velocities, instantaneous center of zero velocity, planer kinetics of rigid body, acceleration forces, work and energy, impact and momentum.

References:

1- Engineering Mechanics: Statics & Dynamics by Russell Hibbeler, Pearson; 14th Edition, 2015.

BAS016 Physics of Light, Heat and Magnetism (2,1,2)

Principles of heat and thermodynamics: Zero law, first and second Law of thermodynamics, heat transfer, gas theory, temperature measurement methods. Light and laser physics: general concepts of light, straight diffusion of light, Velocity of light diffusion, light beam, optical beams, geometric light, reflection and refraction, wave radiation modeling, wave dissipation, diffraction of light, introduction to lasers, Einstein's equations and magnification Light, Explanation of some lasers (gas, solid and liquid lasers), laser applications. Magnetism: magnetic field, Faraday magnetic law, magnetic induction, Boit-savart's law, Ampere's law, laboratory experiments.

References:

1- Modern Classical Physics: Optics, Fluids, Plasmas, Elasticity, Relativity, and Statistical Physicsby Kip S. Thorne , Princeton University Press, 2017.
2- Basic Physics: A Self-Teaching Guide by K Kuhn, Noah Books, 2018

MEC010 Engineering Drawing (1) (0,3,0)

This is an introductory course teaches the basics of technical Drawing using manual drafting instruments. The topics include drawing tools, types of lines, sizes and layout of standard drawing sheets, lettering & numbering, scale use, drawing of geometrical figures, dimensioning, axonometric and isometric views, orthogonal and auxiliary projections, drawing of orthographic projection from isometric view.

References:

1- A Textbook of Engineering Drawing: Along with an Introduction to AutoCAD 2015 by Roop Lal, I K International Publishing House, 2015.

MEC011 Principles of Manufacturing Engineering (1,0,2)

The course introduces the basic concepts of production and productivity. The topics include classification of production processes, industrial safety, engineering materials, ferrous and non-ferrous alloys, steel and its types, cast iron and its types, steel and cast iron production, metal casting processes (sand casting, mold casting, centrifugal casting, wax casting, hot and cold metal forming processes (extrusion, forging, rolling, deep drawing, wire drawing, etc.), metal cutting processes (turning, milling, shaping, drilling, grinding, etc.),metal joining techniques (welding processes, rivets, bolts … etc).Simple workshop measuring tools (Vernier caliper, micrometers, etc.), practical skills in workshops.

References:

1- Workshop Technology (Manufacturing Process) by S. K. Garg, Laxmi Publications; 3rd Revised edition, 2009.

MEC012 Engineering Drawing (2) (0,3,1)

Deduction of the missing orthogonal views, sections in machine members, hatching rules, intersections of solids and surfaces, development of surfaces, drawing of steel structures. Basics of computer aided drafting (CAD) using AutoCAD: Workspace, toolbars, coordinate systems, setting up 2D drawing environment, drawing tools in AutoCAD, object snap, modification tools in AutoCAD, texting and dimensioning in AutoCAD.

References:

1- A Textbook of Engineering Drawing: Along with an Introduction to AutoCAD 2015 by Roop Lal, I K International Publishing House, 2015.

FIRST YEAR

MEC110 Mechanical Drawing (1,3,0)

This course aims to provide the students with basic knowledge on assembly drawings and representation of mechanical components. The topics include: Sections in machine members, Assembly and detailed drawings, Fits and tolerances, Geometrical tolerances, Surface texture and roughness symbols, Welding symbols. The students can Identify the different types of machine elements like gears, shafts and keys, journal bearings, anti-friction bearings, springs, valves, pulleys, pipelines, clutches and breaks ...etc. Applications on assembly drawings of jacks, vices, valves, gearboxes …etc are provided. Applications using of 3D modeling software (like SolidWorks or Autodesk Inventor) to draw and assemble machine components to construct a complete complex machine in addition to make detailed drawings.

References

1- Textbook of Engineering Drawing, K. Venkata Reddy, Second Edition, BS Publications, 2008.
2- Machine Drawing – K.L, Narayana, P. Kannaiah, and K. Venkata Redd, New age Int. Publisher, Third Edition.
3- Geometric and Engineering Drawing, Ken Morling, 3rdEdition, 2012.

ELE170 Electrical Engineering (2,2,0)

Electrical circuits basics (resistors –coils- capacitors -Various sources of electrical waves) DC circuits and electrical theories(Kirchhoff - Thevenin - Norton - assembly) - nodes and tracks equations –AC current circuits and phasor diagram to represent it - A balanced and unbalanced 3-phase system–resonance in electrical circuits and frequency domain response–harmonics in electrical circuit.

References

1- James, W. Nilsson, "Electric Circuits " 7th Edition,2009
2- Joseph, A. "Electric Circuits" McGraw-Hill International Book Company, New York ,1972.

MEC111 Materials Science (1,1,3)

Atomic structure, interatomic bonding and structure of crystalline solids, defects in crystalline solids, dislocations and strengthening mechanisms, phase diagrams, iron-carbon phase diagram, , phase transformation and heat treatment of metals, time-temperature-transformation (TTT) diagrams, Steels and its alloys, Cast iron and its alloys, Non-ferrous alloys (aluminum, copper, magnesium, zinc).The structure of polymers, ceramics and composite materials.

References

1- Material science and engineering: an introduction, W.DCallister, Jr., 8thedition.
2- Essentials of Materials Science and Engineering, Donald R. Askelandand Pradeep P. Fulay, 2nd Edition.
3- Materials for engineering, J. W. Martin, 3rdedition

BAS110 Statistics & Theory of Probability (2,2,0)

Descriptive statistics, Statistical classification of data, Measures of central tendency, Measures of dispersion, Probability theory, Independent and dependent events, Conditional probability, Bayes theorem, Random variable, Probability density function, Discrete probability distributions, Continuous probability distributions, Central limit theorem , Test of hypothesis.

References

1- Foundations of the Theory of Probability, A N Kolmogorov, 2018

Probability and Mathematical Statistics: Theory, Applications, and Practice, Mary C. Meyer, ISBN-13: 978-1611975772.

BAS111 Engineering Mechanics (1,3,0)

Statics: internal forces, friction, center of mass, virtual work. Dynamics: moment of inertia, work and energy, impulse and impact, introduction to mechanical vibrations.

References

1- Engineering Mechanics (Dynamics), by R.C. Hibbeler, 6th edition, Macmillan Publishing company.
2- Vector mechanics for Engineers (Dynamics), by Beer and Johnson.
3- Elements of statics and dynamics, by S.L. Long.

MEC112 Manufacturing Technology (1) (2,1,1)

The topics include conventional machining operation such as turning, drilling, milling, shaping and gear cutting, grinding ...etc. Calculation of machining and production times, dimensional measurements and tools, operations sequences and operation cards. Introduction to production management and planning, Introduction to cost analysis. Practical applications in workshops.

References

1- Manufacturing Technology, Part I, C. Elanchezhian, B. Vijaya Ramnath, 2nd edition, 2006.
2- Manufacturing Technology, Part II, C. Elanchezhian, B. Vijaya Ramnath, 2nd edition, 2007.
3- Introduction to Basic Manufacturing Processes and Workshop Technology, Rajender Singh, New age Int. Publisher, 2006.

MEC120 Thermodynamics (2,2,1)

Basic concepts of thermodynamics, energy concepts, pure materials and the use of steam tables, ideal gas model, first law of thermodynamics and its applications, energy equation for closed systems and their applications on different thermal processes, energy equation for open systems, procedures for instability and stability of open systems, reversible procedures and non-reversible procedures , the second law of thermodynamics, Carnot cycle, thermal machines and its efficiencies, entropy and change in entropy, the definition of entropy efficiencies , possible Energy, reversible work, and availability analysis.

References

1- Yunus, A. C, Thermodynamics, An Engineering Approach, McGraw-Hill, 8th edition, 2010.
2- Van Wylen, G. Sonntag R. and Borgnakke, C. Fundamentals of Classical Thermodynamics, John Wiley & Sons, Inc. 6thedition, 2001.

BAS112 Differential Equations (2,2,0)

Functions of several variables, Partial differentiation, Maximum and minimum values, Conditional extrema, Curvature, Double and triple integrals, Line integral, Ordinary differential equations, first order and higher order, Linear Systems of ordinary differential equations, Vectors analysis, Gradient, Laplace transformations, Inverse Laplace transformations.

References

1- Elementary Differential Equations and Boundary Value Problems, William E. Boyce, Richard C. DiPrima, Douglas B. Meade, ISBN-13: 978-1119443766.
2- Schaum's Outline of Differential Equations, 4th Edition (Schaum's Outlines) 4th Edition, by Richard Bronson, Gabriel Costa, ISBN-13: 978-0071824859.

MEC121 Fluid Mechanics (1) (2,1,2)

Introduction and basic concepts and fluid properties, fluid statics and hydrostatic pressure forces and their applications, fluid flow characterization, fluid motion principles and fluid kinematic , concept of controlled volume and integral equation for Reynolds theory, law of mass conservation and its applications, law of momentum conservation and its applications, energy conservation law ,Bernoulli equation and its applications, Basics of dimensional analysis and dynamic symmetry, laminar and turbulent flow in pipes, friction coefficient and major and minor losses, flow in pipes and tubes and piping system.

References

1- Fundamentals of Fluid Mechanics By B.R. Munson, D.F. Young, T.H. Okiishi, W.W. Huebsch 6^{th}Editon, Wiley, NY (2010)
2- Fluid Mechanics: Fundamentals and Applications By Y. Cengel, McGraw-Hill, NY (2006).
3- Fluid Mechanics By F. M. White, McGraw-Hill, NY (2003).
4- Introduction to Fluid Mechanics By R.W. Fox, A.T. McDonald, and P.J. Pritchard, Wiley, NY (2004).
5- Elementary Fluid Mechanics By R. L. Street, G.Z. Watters, and J.K. Vennard, Wiley, NY (1996).
6- Engineering Fluid Mechanics by Donald F. Elger, Barbara C. Williams, Clayton T. Crowe, John Wiley & Sons; 9^{th}edition, 2009.

MEC113 Mechanics & Testing of Materials (2,1,1)

Study of the mechanical behavior of solid bodies (bars, axes, beams, etc.) under the effect of different loads, thermal stresses, the relationship between uniform strain and stress, axial deformation (uniaxial), shear forces and bending moments in beams, stress in beams, torsion in shafts and pipes with thin walls, combined loads, pressure vessels with thin walls, analysis and transformation of plain stresses and strains. Mechanical tests of the materials (hardness - impact - tension - compression - bending - shear - torsion - wear - creep), non-destructive tests of metals (X-ray diffraction - ultrasonic waves - magnetic methods ... etc.), practical experiments in the laboratory to perform the mechanical tests.

References

1- Testing of Engineering Materials by: Carl William Muhlenbruch
2- Hibbeler, R. C. Mechanics of Materials. 6thed. East Rutherford, NJ: Pearson Prentice Hall, 2004. ISBN: 9780131913455.
3- Crandall, S. H., N. C. Dahl, and T. J. Lardner. An Introduction to the Mechanics of Solids. 2nd ed. New York, NY: McGraw Hill, 1979. ISBN: 9780070662308.
4- Vernon John. Testing of Materials, Macmillan, 1992. ISBN: 0333447832, 9780333447833

MEC102 Engineering Mathematics Using Computer (1,0,3)

Introduction to MATLAB and the basics of computer programming using MATLAB. MATLAB environment, MATLAB variables, vectors, matrices, matrix algebra, 2D and 3D plots, conditional loops, scripts, functions, file Input-Output, structures, cells. Using MATLAB for solving linear and nonlinear equations, differential equations and numerical integration. Applications in fluid mechanics, mechanics, statistics …etc.

References

1- Computer Programming with MATLAB, J. Michael Fitzpatrick, ÁkosLédeczi, 2015
2- An Engineer's Introduction to Programming with MATLAB 2018, Shawna Lockhart, Eric Tilleson.

SECOND YEAR

MEC210 Engineering Economy & Accounting (2,2,0)

The basic concepts of engineering economy, Time-money relationships, cash flow, and effects of inflation, Present worth (PW) method, annual worth (AW) method, rate of return (ROR) method, benefit/cost ratio (B/C) method, and incremental rate of return analysis, Depreciation schedules, replacement analysis, and after-tax analysis, cost estimation and indirect cost allocation,break-even analysis and payback period, selection among competing alternatives, Sensitivity analysis and expected value decisions.

References

1- Sullivan; wicks and koelling "Engineering Economy" 6^{th}ed. 2015 by Pearson h. Ed Inc
2- Blank and Tarquin "Engineering Economy" 8^{th}ed. 2018 by McGraw hill.

MEC201 Theory of Measurements & Sensors (1,1,3)

Basic concepts of measurements and analysis of experimental results; introduction and fundamentals of measurement and calibration devices; measurement errors, measurements Linearity; different statistical methods; static and dynamic characteristics of sensors; adaptation of measurement signals; measurement of the displacement, velocity, acceleration, temperature, pressure, strain, flow, force; signal adaptation; actuators (mechanical, hydraulic, pneumatic, electrical); Dimensions Tolerances and allowances; basics, design and application of limit measurement parameters.

References

1- Measurement & Instrumentation Principles,3rd Edition by Morris
2- Measurement and Instrumentation. Theory and Application, Alan S. Morris, Reza Langari 2012
3- Maintenance of Instruments and Systems [2 ed.], Lawrence D. Gottschee, Lawrence D. Gottschee 2004

BAS211 Numerical & Complex (2,2,0)

Numerical differentiation and integration, Solving system of linear equations, Solving system of nonlinear equations, Numerical methods for solving ordinary differential equations, Partial differential equations, Wave and heat equations, Fourier series and Fourier integrals, Integration by residue theorem.

References

1- Numerical Methods for Scientists and Engineers, R. W. Hamming, ISBN-13: 978-0486652412.
2- A First Course in Numerical Analysis: Second Edition, Anthony Ralston, Philip Rabinowitz, ISBN-13: 978-0486414546.
3- Complex Analysis, 3rd ed. 2010 Edition, Joseph Bak, Donald J. Newman, ISBN-13: 978-1441972873.

MEC211 Kinematics & Dynamics of Rigid Bodies (2,2,1)

Kinematics machines: Types of mechanisms, degree of freedom of mechanisms, Kinematics movement of the rigid objects, introduction to planner mechanisms, kinematics analysis of the planer mechanisms: (Displacement, velocity, acceleration), the characterization of the different types of gears (simple, composite, planetary) design and analysis of the form of camshafts and attachments, Kinematics of belts and chains. Machines dynamics: planar motion dynamics of the rigid bodies, analysis of the static and dynamic forces at mechanisms, the dynamics of reciprocating machines, sketches of rotation torque diagrams, dynamic equilibrium, gyroscope, design of the appropriate flywheels for different engines and various mechanisms.

References

1- R.C. Hibbeler, "Engineering Mechanics: Dynamics," 9th edition, Prentice Hall, 2001.
2- F.P. Beer and E.R. Johnston, "Mechanics for Engineers: Statics," 4th edition, McGraw-Hill book company, 1984.
3- Bedford and W. Fowler, "Engineering Mechanics: Statics & Dynamics Principles," Prentice Hall, 2003.

MEC212 Manufacturing Technology (2) (2,1,2)

Introduction to foundry technology, pattern making and design, technology of moulding and core making, testing of moulding sand, different types of moulding sand and their properties, gating system design and risering, melting technology, casting defects and its remedy, casting methods-Fettling and heat treatment of casting- Welding technology: Basic aspects of welding, solid state welding methods, fusion welding methods, welding defects and remedy, destructive and non-destructive tests.

References

1- Principles of Foundry Technology, 4th edition, P. L. Jain.
2- A Textbook of Manufacturing Technology, Er. R.K. Rajput.
3- Workshop Technology, S.K., Garg.
4- Manufacturing Process, B.H. Amstead, Phillip Ostwald, Myron L. Begemaw.
5- Workshop Technology, Vol. II, Dr. R.K. Singal
6- Manufacturing Engineering and Technology, Schmid, S. , and Kalpakjian , S., Pearsan Education, Inc., 6th Edition, 2006
7- اساسيات هندسة صب (سباكة) المعادن د. احمد سالم الصباغ – هندسة عين شمس.
8- تكنولوجيا الانتاج والتصنيع د. محمد صلاح الدين عباس حامد – د. ابراهيم موسى ابراهيم.

MEC213 Mechanical Design (1) (2,4,0)

Concepts of mechanical design, primary steps of the mechanical design, engineering materials, engineering manufacturing considerations of the mechanical design, design of mechanical parts under the effect of static and repeated loads, stress concentration, safety factor, bolts design, design of temporary and permanent joints (by thread bolts, welding, rivets), design of power screws, design of springs, design of pipe joints, design of hydraulic cylinders, design of pressure vessels.Design projects using 3D modeling programs such as (SolidWorks or Autodesk Inventor).

References

1- Richard G. Budynas, and J. Keith Nisbett, Shigley's Mechanical Engineering Design 9th Edition, McGraw Hill, ISBN 978-0-07-352928-8 (alk. paper)
2- Black and Adams and Machine Design.
3- GalalShawki and Design Data Tables
4- R.S. Khurmi, J.K. Gupta, A Textbook of Machine Design, Eurasia Publishing House (PVT.) LTD., 2005.

MEC220 Heat Transfer (2,1,2)

Introduction to heat transfer methods, one dimensional conduction, conduction with internal source of heat, continuous conduction in two directions, unstable conduction in one direction, Convection heat transfer, natural and forced convection, extended surfaces, Fins.

References

1- Frank P. Incropera, David P. Dewitt. "Introduction to Heat Transfer" 6th Edition.
2- Kreith, F. and Black, W. Z., Basic Heat Transfer, Harper and Row Publishers, New York (2000).
3- Kreith, F., Principles of Heat Transfer, Crowell, New York (2005).

MEC214 Mechanical Vibrations (2,2,0)

Properties of vibrational motion, derivation of the governing differential equations, free and damping vibration, forced harmonic motion, the imbalanced rotation and reciprocation, the motion of carriages, vibration isolation, transmitted vibration, free vibrations of systems with two-degrees of freedom, instant analysis, vibration of system with many degrees of freedom, continuous systems, numerical and computational methods to determine the natural frequencies.

References

1- Engineering Vibration Analysis with Application to Control Systems, Edward Arnold, 1995
2- Mechanical Vibration, by William J. Palm III, ISBN-13: 978-0471345558
3- Singiresu S. Rao, Mechanical Vibrations 5th Edition, ISBN-13: 978-0132128193.

ELE270 Electrical Machines (2,1,1)

Three-phase systems, the basics, power, transmission, DC machines, the electric generator, electric motors, AC machines, generator, induction motor, Synchronous motor, special motors, electric transformer, equivalent circuits, design characteristics, substation, circuit breakers, insulators, main conductors, protection.

References

1- A Text Book of Electrical Technology Vol. II AC & DC Machines, Theraja B. L., Published by S Chand and Company Limited, 2007
2- Electrical Transformers and Rotating Machines 4th Edition, Stephen L. Herman, ISBN-13: 978-1305494817
3- Transformer Principles and Applications, Otto Taylor, Jim Overmyer , Ron Michaelis, ISBN-13: 978-0826916044

MEC221 Fluid Mechanics (2) (2,1,1)

Navier-Stokes equations for fluid flow, Approximate and analytical solutions for differential equations, ideal flow, laminar flow, laminar flow on horizontal and inclined planes, boundary layers, an introduction to turbulent flow and physical nature, mathematical modeling examples, unstable flow in pipes and water hammer.

References

1- Fundamentals of Fluid Mechanics, B.R. Munson, D.F. Young, T.H. Okiishi, W.W. Huebsch 6thEdition, Wiley, NY (2010)
2- Fluid Mechanics: Fundamentals and Applications, Y.Cengel, McGraw-Hill, NY (2006).
3- Fluid Mechanics, F. M. White, McGraw-Hill, NY (2003).
4- Introduction to Fluid Mechanics, R.W. Fox, A.T. McDonald, and P.J. Pritchard, Wiley, NY (2004).
5- Elementary Fluid Mechanics, R. L. Street, G.Z. Watters, and J.K. Vennard, Wiley, NY (1996).
6- Engineering Fluid Mechanics, Donald F. Elger, Barbara C. Williams, Clayton T. Crowe, John Wiley & Sons; 9thedition, 2009.

THIRD YEAR

MEC310 Engineering Project Management (2,2,0)

Introduction engineering project management, projects analysis, network analysis samples, balancing of time and cost, resources planning, monitoring and control of engineering projects, performance evaluation of engineering projects, the concept of a feasibility study, elements of feasibility study, planning and control of the small projects, use of computer for planning and control of the projects using the Microsoft Project software, case studies and applications.

References

1- Engineering Project Management, Neil Siegel, 2019 John Wiley & Sons, Ltd.
2- Engineering Project Management for the Global High-Technology Industry – Sammy G. Shina, last edition
3- Engineering Design, Planning, and Management – Hugh Jack, last edition

MEC320 Hydraulic & Pneumatic Systems (2,0,3)

Introduction to Fluid Systems, Main parts of pneumatic circuits and hydraulic circuits (joints and fittings), Compressors, Pumps, pneumatic and hydraulic motors, maintenance and safety in fluid systems, electrostatic control in hydraulic and pneumatic circuits.

References

1- Introduction To Hydraulics and Pneumatics, 3rd Ed, Ilango Sivaraman, PHI Learning Pvt. Ltd., 2017.
2- Fluid Power Dynamics, By R. Keith Mobley, Newnes Publisher, 2000.
3- Hydraulics and Pneumatics: A Technician's and Engineer's Guide, Andrew Parr, Elsevier, 2011.

MEC330 System Dynamics (2,2,0)

Natural systems (mechanical, electric, hydraulic, thermal…), modeling using signal diagram, simulation definition (simulation for natural parts and simulation with programs), principles of simulation of natural systems (mechanical, electrical, hydraulic, thermal, medical), simulation techniques via computer, applications using modern software packages such as MATLAB or LabVIEW.

References

1- System Dynamics: Modeling, Analysis, Simulation, Design, Ernest Doebelin, ISBN-13: 978-0824701260
2- System Dynamics: Modelling and Simulation, BilashKanti Bala, Fatimah Mohamed Arshad, KusairiMohd Noh, Springer, 2017.

MEC311 Mechanical Design (2) (2,2,0)

Design of power transmission shafts, types and design of keys, belts and chains, types and design of pullies, design of couplings and brakes, design of different types of gears: spur, helical and bevel gears …etc., design of sliding bearings, hydrodynamic and hydrostatic bearings, anti-friction bearing selection, gear box design.Design projects using SolidWorks or Autodesk Inventor mechanical design software package.

References

1- Richard G. Budynas, and J. Keith Nisbett, Shigley's Mechanical Engineering Design 9th Edition, McGraw Hill, ISBN 978-0-07-352928-8 (alk. paper)
2- Black and Adams and Machine Design.
3- GalalShawki and Design Data Tables
4- R.S. Khurmi, J.K. Gupta, A Textbook of Machine Design, Eurasia Publishing House (PVT.) LTD., 2005.

MEC312 Theory of Metal Cutting (2,2,2)

Cutting tools materials, cutting tools life time and its wear, machinability of metals, cutting operation mechanisms with single and multiple point cutting edges tools, orthogonal and inclined cutting, cutting forces diagrams, speed curves, specific energy and power, metal removal rate, heat effect during cutting operations, cutting forces analysis, heat effect during turning, milling and drilling, dynamometers.

References

1- Metal Machining: Theory and Applications (2000),ISBN: 034069159X
2- Metal Cutting Theory and Practice, 3rd Edition, by David A. Stephenson , John S. Agapiou, ISBN-13: 978-1466587533.

MEC300 Field Training (1) (0,0,0)

Duration of the training: four weeks equivalent to 160 training hours (8 Hours per day × 5 Business Day × 4 Weeks). The student is required to spend a month in an industrial facility for training that is relevant to his/her field of study. The department council will assign the faculty members to set the training plan with the industrial partners and to follow up on the student's progress. The students will be divided into groups, each consists maximum of 5 students. At the end of the training period, the student is required to submit a report and give a presentation before an examination panel from the department and/or industrial partners. In the report and presentation, the student would highlight the achievements and/or challenges she/he has gone through during the training period. 25 marks of the student's score is provided by the industrial training supervisor and the remaining 25 marks is determined based on: the student's report, final presentation, and how well the student responds to the examination board questions.

References

According to the field of training

MEC331 Automatic Control (2,2,0)

Transient response for 1st and 2nd degree control system, root locus method, stability analysis (Nyquist, phase angle margin, gain margin), control system compensation (Bode diagram, polar plots, log magnitude versus phase plots, lead-lag-lead/lag compensation, polar and Bode plots for compensator, an introduction for pole placement based on feedback, design of observer and compensator based on the dynamic feedback, data analytics, design of industrial controller of type (proportional P, Integrator I and differentiator D then PI and PID, introduction to state space, introduction to controllability and observability.

References

1- Automatic Control Systems 7th Edition, Kuo, Benjamin C., JhonWiely& Sons, 2003.
2- Modern Control Engineering, K. Ogata, Printice Hill, 2010.
3- Automatic control System, F.Golnaraghi, Johon Wiley, 2010.

MEC314 Advanced Engineering Materials (1,2,2)

Structures, classifications, properties and applications of ceramics, plastics, composite materials, Nanomaterials, smart materials, superalloys, amorphous materials, porous materials. Manufacturing and forming processes of the advanced materials.

References

1- Advanced Engineering Materials and Modeling (Advanced Material Series) 1st Edition, Ashutosh Tiwari, N. Arul Murugan, Rajeev Ahuja, ISBN-13: 978-1119242468.
2- Material science and engineering: an introduction, W.D Callister, Jr., 8thedition.
3- Essentials of Materials Science and Engineering, Donald R. Askelandand Pradeep P. Fulay, 2nd Edition.
4- Materials for engineering, J. W. Martin, 3rdedition

MEC313 Theory of Metal Forming (2,2,0)

Introduction to theory of plasticity, plastic deformation of metals, stress-strain relations, yield criteria, flow stress, slip-line field theory, calculation of the required forces to perform wire drawing, extrusion, forging, shear, deep drawing and rolling processes, sheet metal forming mechanisms, precision shearing, contour forming sheet, metal forming machines.

References

1- Metal Forming Practice, Processes – Machines Tools, Translated by Anne Koth (2005)
2- Metal Forming " Fundamental and applications. Taylan Altan, ASM Series in Metal Processing
3- Element of Metalworking Theory" Geoffrey W. Row

MEC316 Quality Control (2,2,0)

Introduction to quality control (QC); The use, types and objectives of control charts; control charts for variables, control charts for attributes; Samples, definition, advantages, disadvantages and selection, OC curve, quality levels, reliability, reliability analysis, computer aided quality control; Inspection techniques and computer aided inspection methods; Total quality management (TQM), ISO 9001-9004…etc. Applied examples using Mini-Tab Software.

References

1- Introduction to statistical quality control 7th edition, Douglas C. Montgomery
2- Fundamentals of Quality Control and Improvement, Third Edition, AmitavaMitra, 2008 John Wiley & Sons, Inc.

MEC318 Computer Aided Design (CAD) (2,0,4)

Using of computers in engineering design, Components of CAD systems, 2D and 3D CAD drawings, Computer graphics, 2D and 3D transformations, Solids modeling techniques, Surface modeling techniques, Mechanical design programs,Fundamentals of finite element analysis, Design projects using computer software e.g. SolidWorks, Simulation Xpress and Ansys …etc.

References

1- AutoCAD 2019 Tutorial First Level 2D Fundamentals, Randy H. Shih;Luke Jumper.
2- AutoCAD LT 2020 for Designers, 13th Edition, Prof. Sham Tickoo Purdue Univ., CADCIM Technologies.

FOURTH YEAR

MEC410 Materials Selection of Materials for Mechanical (2,2,1)

Types and properties of engineering materials, materials selection necessity for mechanical design, materials selection charts, basics of materials selection, materials selection for manufacturing, computer aided materials selection, improvement of the available materials for production or production of new materials to cover a wide range of the required properties such as physical and chemical properties, surface heat-treatment, diffusion, microstructure, recrystallization, age hardening, phase transformation, grains growth and composite materials.

References

1- Materials and Design: The Art and Science of Material Selection in Product Design, by Michael F. Ashby. Butterworth-Heinemann (19 December 2013)
2- Decision Making in the Manufacturing Environment, by R. Venkata Rao, 2006

MEC411 Computer Aided Manufacturing (CAM) (1,0,4)

Basics of automated manufacturing processes, numerical control (NC) and computer numerical control (CNC) manufacturing systems, CNC machines (types and method of operation), basics of CNC machines programming, industrial robot, flexible manufacturing systems (FMS), computer integrated manufacturing systems (CIM), group technology (GT), computer aided production planning (CAPP). Laboratory exercises in CNC Lab.

References

1- “ Computer Integrated Design and Manufacturing” by David Bedworth and Philip Wolfe.
2- Automation, Production systems and Computer Integrated Manufacturing” by M P Groover.
3- “Robots and Manufacturing Automation” by C R Asfahl

MEC413 Manufacturing Technology (3)† (2,0,1)

Introduction to non-traditional machining, Classification of non-traditional machining processes, Abrasive Jet Machining (AJM), Ultrasonic Machining (USM), Water Jet Machining (WJM), Abrasive Water Jet Machining (AWJM), Electrochemical Machining (ECM),Electro Chemical Grinding (ECG), Electro Jet Drilling (EJD), Electro-discharge machining (EDM), Laser Jet Machining (LJM), Electron Beam Machining (EBM), Chemical Milling (CHM), Photochemical Milling (PCM) …etc. Laboratory exercises.

References

1- Manufacturing Technology Paperback 4th edition, Rao, 4 edition, 2018
2- Manufacturing Engineer's Reference by Dal Koshal.

MEC400 Field Training (2) (0,0,0)

1- Duration of the training: four weeks equivalent to 160 training hours (8 Hours per day × 5 Business Day × 4 Weeks). The student is required to spend a month in an industrial facility for training that is relevant to his/her field of study. The department council will assign the faculty members to set the training plan with the industrial partners and to follow up on the student's progress. The students will be divided into groups, each consists maximum of 5 students. At the end of the training period, the student is required to submit a report and give a presentation before an examination panel from the department and/or industrial partners. In the report and presentation, the student would highlight the achievements and/or challenges she/he has gone through during the training period. 25 marks of the student's score is provided by the industrial training supervisor and the remaining 25 marks is determined based on: the student's report, final presentation, and how well the student responds to the examination board questions.

2- **References**

According to the field of training

MEC414 Feasibility Study of Engineering Projects (1,1,0)

Basic concepts in feasibility study, market feasibility study, technical and engineering study,financial feasibility study, commercial feasibility study for small projects.

References

1- Feasibility Study Preparation and Analysis by Charles Zawde, 2017.

MEC415 Design of Production Aids (1,0,3)

Jigs and fixtures classifications and economics, Jig and fixtures design considerations, location and clamping devices, basic concepts of clamping and force analysis, designing jigs and fixtures for drilling, milling, turning operations … etc. applied projects using SolidWorks or Autodesk Inventor or any other software.

References

1- Manufacturing Engineering and Materials Processing, loan Marinescu, 2002

MEC490 Graduation Project (0,0,11)

This course requires the students, working in teams, to take an actual engineering project from the initial proposal stage through the preliminary design phase to the completion of a conceptual design of the project. Students will conduct the necessary activities and prepare the various documents needed to complete the design. The project should include a theoretical analysis as well as implementation of some parts of the project experimentally or simulation by computer.

References

According to the field of the project

ELECTIVE COURSES

List (1) of Elective Courses

MEC440 Surface & Heat Treatments of Metals (1,2,1)

Surface treatments: case hardening, electroplating, plasma spraying, galvanization, tin plating, chemical surface treatment: phosphates, surface hardening, carbonization, (nitration) flushing, hardening, flame hardening, resin, heat treatment: steel heat treatment: tempering, hardening, annealing, etc., (T-T-T) curves, continuous coaling curves, cast iron heat treatment. Heat treatment furnaces: classification of furnaces, furnaces components and materials used, flame furnaces, electric furnaces, heat treatment processes, experiments in the laboratory.

References

1- "Heat Treatment of Metals" by B Zakharov
2- "Physical Metallurgy for Engineers" by Donald S. Clark
3- "Heat Treatment of Metals" by Vijendra Singh
4- "Heat Treatment: Principles and Techniques" by Rajan

MEC441 Welding Technology & Metallurgy (1,2,1)

Fusion welding operations, electric arc welding, welding metallurgy principles, heat affected zone, preheating, post weld heat treatments, weldability, internal stresses in welded joints, welding defects and inspection methods, welding of stainless steels, welding of carbon steels, welding of aluminum and its alloys, soldering and brazing. Laboratory & workshop experiments.

References

1- "Introduction to Physical Metallurgy of Welding" by K Easterling
2- "Welding Metallurgy" by Sindo Kou
3- "Advances in Welding Science and Technology" by S A David
4- "Advances in Welding Science and Technology" by S A David

MEC442 Fracture Mechanics & Failure Analysis (1,2,1)

Brittle and ductile fracture macrostructures, voids and cracks initiation, elements of fracture mechanics, Griffith criterion, Linear Elastic Analysis Airy stress function, crack tip stresses, finite size effects, crack opening displacement, Plastic Analysis Hydrostatic stress, deviatoric stress, yield criteria, Elastic-Plastic Analysis, Fracture toughness testing, Crack Growth Resistance - R-curves, cyclic fatigue failure, creep failure, Stress corrosion cracking and hydrogen assisted failure. General practice in failure analysis.

References

1- "Failure Analysis of Engineering Materials (Mc-graw-Hill Professional Engineering)" by Charles R Brooks and Ashok Choudhury
2- "Damage and Fracture Mechanics: Failure Analysis of Engineering Materials and Structures" by TaoufikBoukharouba and MimounElboujdaini
3- "Metal Fatigue in Engineering" by Henry O Fuchs and Robert R Stephens

4- "Applied Reliability: Fracture Mechanics 2 (Mechanical Engineering and Solid Mechanics)" by Ammar Grous

List (2) of Elective Courses

MEC443 Finite Element Method (1,2,1)

Brief overview on solid mechanics, Finite element method (FEM) methodology, approaching a problem, Defining FEM Steps, shape function, modelling methods. Application of FEM to 2D and 3D trusses, thin walled structures, mechanical vibration, heat transfer, fluid mechanics, thermal stresses. Applications using computer software e.g. SolidWorks, Simulation Xpress, Abaqus or Ansys …etc.

References

1- "Introduction to Finite Elements in Engineering" by T R Chandrupatla and A D Belegundu
2- "Introduction to the Finite Element Method" by J N Reddy
3- "Finite Element Analysis: Theory and Programming" by C S Krishnamoorthy
4- "Introduction to Approximate Solution Techniques, Numerical Modeling, & Finite Element Methods" by Victor N Kaliakin.

MEC444 Die Design (1,2,1)

Design of banlking and piercing dies, deep drawing dies, extrusion dies, forging dies, permanent mould casting, continuous casting moulds, methods of dies manufacturing, dies materials and heat treatment, dies preparation and maintenance, effect of lubricant on dies performance.Design projects using SolidWorks or Autodesk inventor software.

References

1- Die design Handbook, Forging practice, Heat treatment of metals
2- Die Design Fundamentals, 3rdedition. VukotaBoljanovic.

MEC445 Reverse Engineering (1,2,1)

Reverse engineering in mechanical design, reverse engineering techniques, digitizing or collecting Data from Physical Part, contact and non-contact 3D scanning techniques, coordinates measuring machines (CMM), steps of finding the geometric models, equations for uniform and free shapes surfaces, recognition of other designs characteristics, manipulation of the collected data to obtain a CAD model, data transfer of geometric shapes to CAD/CAM software, STL files, rapid prototyping techniques.

References

1- Reverse Engineering for Beginners by Dennis Yurichev
2- An Introduction to Reverse Engineering by Andrew Huang, 2003

List (3) of Elective Courses

MEC446 Optimum Design (2,1,0)

Optimum design problem formulation to Mechanical Engineering systems, Optimum design concept,Linear programming, Numerical methods for unconstrained and constrained optimum design, Lagrange method.

References

1- Introduction to Optimum Design, THIRD EDITION, JASBIR S. ARORA, 2011.

MEC447 Lean ManufacturingSystems (2,1,0)

Introduction, Lean manufacturing through waste elimination, Value stream mapping, Concepts, Kaizen in lean manufacturing paradigm, Single minute exchange of die, Pull production through Kanban card systems, One piece flow production system, Visual management, The fundamental structure of Agile manufacturing paradigm, Implementation of Agile paradigm in moderate and smart organizations.

References

1- Handbook of Research on Design and Management of Lean Production Systems Modrák, VladimírJan 2014
2- The Lean Management Systems Handbook, Rich CharronH. James Harrington Frank VoehlHalWigginJul 2014
3- Lean System Management for Leaders: A New Performance Management Toolset, Richard Mr Mallory Mar 2018

List (4) of Elective Courses

MEC448 Maintenance & Monitoring of Machines Using Mech.Vibration (2,1,0)

Introduction, brief review on mechanical vibration, fault diagnosis in mechanical systems, maintenance polices, predictive maintenance, faults types, faults analysis, vibration monitoring and analysis, monitoring of machines performance, applications.

References

1- Vibratory Condition Monitoring of Machines, J. S. Rao

MEC449 Design of Machining and Forming Machines (2,1,0)

Design and working principles of machine tool elements (Speed and feed of gear boxes. spindle and spindle bearings, rigidity and strengthening of structures- frames, beds, and design of sideways against wear). Power sources and types of drives. Mechanisms design, motion control and transmission systems in machine tools. Safety devices. Static and dynamic acceptance tests for machine tools.

References

1- Machine Tool Design” by N K Mehta
2- “Machine Tool Design” by N Acharkan
3- “Design and Machine Tools” by S K Basu and D K Pal.

4- “Tool Design” by Cyril Donaldson and George H LeCain
5- “Machine Tools Handbook: Design and Operation” by P H Joshi

UNIVERSITY REQUIREMENTS

GEN0X0 Technical Language (2,0,0)

Characteristics of the English or French or German technical language, grammar review, effective sentences and their characteristics, identify some common mistakes in the writing of technical sentence, paragraph construction, types of paragraphs, development of communication skills by reading and analysis of excerpts from technical writing in various engineering disciplines such as mechanical, electrical , civil ... etc.

References:

1- Mark Hancock & Annie McDonald, English Result - Intermediate Level, Oxford University press, Last Edition .
2- Durrell, Martin, " Using German : a guide to contemporary usage / Martin Durrell", Cambridge, U.K. ; New York : Cambridge University Press, 2003.
3- Coffman Crocker, Mary E, " Schaum's outline of French grammar", McGraw-Hil, Schaum's outline series, 1999, 4th ed.

GEN011 Computer Skills (1,0,1)

IT concepts and terminology, Computer hardware, operating systems, Computer networks, Internet, Computer graphics, Multimedia systems, Databases. Practical applications: Operating system (Microsoft Windows), Word processing (Microsoft Word), Spreadsheets (Microsoft Excel), Microsoft PowerPoint, Databases (Microsoft Access). Introduction to programming concepts, programming languages and their classification, logical design of programs and algorithms, structural programming and object-oriented programming.

References:

1- Practice using ICDL components

GEN012 History of Engineering & Technology (2,0,0)

The definition of science, technology, engineering and architecture. The development of civilizations and their relationship to human sciences (ancient Egyptian civilization, Roman and Greek civilization, Mesopotamia, dark ages, industrial revolution). Different engineering disciplines and their role in society. The historical relationship between science and technology. The relationship between the development of engineering, the social and economic development of the environment, the challenges of globalization and the new economy. The contribution of engineers in the new millennium, the issues of economic and industrial development in Egypt.

References:

1- James E. McClellan & Harold Dorn, Science and Technology in World History: An Introduction, The Johns Hopkins University Press, 2nd. Ed., 2006.
2- Richard Shelton Kirby, Engineering in History, Dover publications, 1990.

GEN900 Communication & Presentation Skills (1,1,0)

General introduction to communication, the importance of communication, types of communication, communication barriers, listening skills, attributes and methods of reading, verbal communication: speaking and writing skills, non-verbal communication, dialogue skills and strategies of persuasion, communication in the work environment, writing CVs, reports and official letters.

References:

1- Gary Johns and Alan M. Saks, Organizational Behavior, Addison Wesley Longman, 2009.
2- Scgermerhorn, Jr., R. J., Hunt, G. J., and Osborn, N. R., Organizational Behavior, John Wiley & Sons, Inc., New York, 10th. Ed., 2008.

GEN902 Human Rights and Combating Corruption (1,1,0)

Human rights: general introduction, definition of human rights, characteristics and principles of human rights, general rules of the idea of human rights, historical development of the idea of human rights, types of human rights, individual rights, collective rights (people's rights), sources of human rights, legal system of rules of protection Human rights, human rights according to the Egyptian constitution in 2014, the duties and obligations of individuals in society. Combating corruption: definition of corruption, its causes, effects and characteristics, types of corruption and its causes, the impact of corruption on human rights and development, the impact of corruption on economic rights and sustainable development, criminal confrontation of corruption.

References:

1- Peter Joseph , The New Human Rights Movement: Reinventing the Economy to End Oppression, Inc. Blackstone Audio: Books, 2017

GEN903 Research and Analysis Skills (1,1,0)

Scientific thinking and its characteristics, definition of scientific research and its characteristics, steps of scientific research (selection of the subject of research, determine the problem of research and selection factors, determine the framework of research, determine the method of research, data analysis), types of scientific studies: exploratory studies, descriptive studies, experimental studies . Methods of scientific research: descriptive approach, social survey, content study, content analysis. Data collection tools: Metrics, observation, interview, questionnaire. Data presentation and analysis methods: Descriptive methods, deductive methods.

References:

1- Gary Johns and Alan M. Saks, Organizational Behavior, Addison Wesley Longman, 2009.
2- Scgermerhorn, Jr., R. J., Hunt, G. J., and Osborn, N. R., Organizational Behavior, John Wiley & Sons, Inc., New York, 10th. Ed., 2008.

GEN901 Theory of Sustainability (1,1,0)

The course aims to introduce students to the concept of sustainability and its feasibility in order to develop its capabilities to reach architectural applications that contribute to achieving the goals of sustainability and its usefulness and to clarify the risks of unsustainable environment. The course deals with the components of the natural environment and the factors of preserving its components and equilibrium, the biological system, cycles and ecological chains, the presence characteristics of natural resources, energy and biological systems. Rapid development of sustainability applications and their comprehensiveness based on modern means of communication and digital technologies.

References:

1- Perspectives for a New Social Theory of Sustainability, Mariella Nocenzi and Alessandra Sannella, Springer Nature Switzerland 2020 .

GEN904 Entrepreneurship (1,1,0)

Concepts in Entrepreneurship, Entrepreneurship and Small Enterprises, Generating Ideas for Entrepreneurial Projects, University and Entrepreneurship Opportunities and Challenges, Marketing Plan, Operational Plan, Financial Plan, Business Plan Writing, Technological Environment of Entrepreneurship, External Business Environment of Entrepreneurial Projects, Support Programs for Leading Projects Egyptian Economy, Entrepreneurial Project Presentation Skills.

References:

1- Entrepreneurship: An Evidence-Based Guide by Robert A Baron Edward Elgar Pub., 2012.

GEN905 Professional Ethics (1,1,0)

The course provides the background needed to discuss the core topics of engineering ethics, with a focus on the ethical issues facing engineers in the areas of engineering work in companies. The course includes the definition of the general elements of the ethics of the profession and the observance of the public interest and regulations and regulations, obligations to the community, the responsibilities of engineers, disclosure of violations, behavior, basic principles and codes of the ABET code of conduct of engineers.

References:

1- William Frey, Professinnal Ethics in Engineering, November, 2013, http://cnx.org/content/col10399/1.4/

GEN908 Contracts and Legislation (1,1,0)

The course aims to provide the student with the technical and legislative knowledge related to the practice of the profession. The study of building legislation, urban planning and the laws governing the practice of the profession and the work systems (engineer / owner / contractor / ...) at the local and international levels as well as studying the methods of contracting/rules and systems for the preparation of integrated implementation documents. Tenders and methods of their examination and evaluation.

References:

1- Randall S. Schuler, Susan E. Jackson, Strategic Human Resoure Management , Wiley, 2nd ed., 2007.

2- Lewicki, J. R., Saunders, M. D., and Barry, B., Essentials of Negotiation, McGraw - Hill, 5th. Ed., 2011.

GEN906 Critical Thinking (1,1,0)

Theoretical concepts (memory, thinking, creativity), an introduction to the thinking skills, the nature of thinking (definition, characteristics, levels), types of thinking (creative, critical, scientific), cognitive thinking skills, meta-cognitive thinking skills, thinking measurement tools, strategies Used in the development of thinking skills, programs to teach thinking skills, methods of teaching thinking skills.

References:

3- Critical Thinking: A Beginner's Guide to Critical Thinking, Better Decision Making and Problem Solving Paperback, by Jennifer Wilson,, Create Space Independent Publishing Platform 2017.

GEN907 Human Resources Management (1,1,0)

Historical development of human resources management, key functions of human resources management, human resources planning, access to human resources, training and development of human resources, compensation of human resources, human resource conservation.

References:

1- Human Resource Management, University of Minnesota Libraries Publishing, 2016

GEN909 Method of Scientific Research and Writing (1,1,0)

The course aims to develop the student's abilities to conduct applied scientific research in one of the fields presented for the graduation project and train to work within a research team, while following the steps of sound scientific research to draw conclusions. The elements and components of scientific research: research problem, scientific method to solve problems and fundamental differences between different scientific research methods, methods of collecting data and statistics necessary for research, methods of examination and analysis of data and information and scientific dealing with variables, formulation of research hypotheses, methods of discussion and examination of hypotheses, drawing conclusions. Scientific method of writing a scientific research (thesis writing). The students select one of the problems in the architectural, urban or any technical field, previously presented as the basis for the graduation project, to conduct the necessary scientific research. Finally, the student is discussed orally through a committee to evaluate the student's performance, within his group, and his findings, studies, analyzes, conclusions and recommendations for the graduation project thesis.

References:

1- Research Methodology and Scientific Writing, by C. George Thomas, Ane Books Pvt. Ltd., 2016

MECHATRONICS ENGINEERING PROGRAM (MECH. SYSTEMS ENGINEERING)

Program Information

1. Faculty vision:

The faculty of Engineering at Shoubra, Benha University, aspires to be a pioneering college at the national, regional and international levels in the fields of engineering education, scientific research, innovation and entrepreneurship in order to achieve the goals of sustainable development.

2. Faculty Mission:

The faculty of Engineering at Shoubra is committed to prepare a graduate with competencies and problem-solving skills [1] that qualify each engineer to compete in local and regional labor markets [2], the graduate will be able to innovate and become an entrepreneur [3], the faculty is also committed to the development of engineering sciences [4] and producing internationally distinguished scientific research [5], within the framework of human values and social responsibility [6].

3. Program Vision:

Mechanical Design and Production Engineering Program, faculty of Engineering at Shoubra, aspires to be a pioneering program in education and scientific research in the fields of mechanical design and production engineering at the regional and international levels and to provide an outstanding community service to the community and the surrounding environment.

4. Program Mission:

The Mechatronics Engineering program is committed to build the character and develop multidimensional personality of future graduating multi disciplinary mechatronics engineers through rigorous synergy integration curricula, and to advance knowledge to benefit the society locally, regionally, and internationally through scholarly research. The Mechatronics Engineering Program will provide students with the tools necessary to solve Mechatronics problems critical to our society’s well-being.

The Program will prepare graduates for entry into the Mechatronics profession, for life-long learning, and to take their role as Mechatronics engineers in a global society, In addition to developing research and scientific studies and upgrading their quality in line with the needs of society. This will be accomplished through a scientific broad-based Mechatronics engineering curriculum emphasizing fundamentals, practical applications, oral and written communication skills, computer applications skills, and professional practice issues, ethics and environmental protection.

To judge the compatibility between the program mission and faculty mission, the following matrix is used.

Key Words of Faculty Mission / Key Words of Program Mission	Prepare a graduate with competencies and problem-solving skills [1]	Compete in local and regional labor markets [2]	Innovate and become an entrepreneur [3]	Development of engineering sciences [4]	Producing internationally distinguished scientific research [5]	Human values and social responsibility [6].
Preparing a graduate equipped with knowledge and skills	√		√	√		
Compete in local and regional labor markets		√				
[Innovate and become an entrepreneur			√			
Distinguished community participation	√			√	√	√
Human and moral values						√
Produce scientific research						√

5. Program Objectives:

The Mechatronics Engineering Program Objectives are as follows:-

1. Apply and synergistic integrate knowledge and understanding of mathematics, physics, engineering sciences and skills to solve engineering problems in various multidisciplinary mechanical, electronics, control and computer programs available to solve real problems in industries, automation application to meet the required needs within realistic constraints.
2. Identify, formulate, and solve basic engineering problems and use appropriate engineering techniques, skills and tools necessary for engineering practice and project management.
3. Apply industrial security, and understanding of the ethical, legal obligations needed to function as part of a professional enterprise and to protect human health and welfare, and to preserve the environment in a global society.
4. Ability to apply engineering skills and work in multi-disciplinary teams to identify and formulate solutions for Mechatronics problems, and to analyze and design mechatronics project, and lead or supervise a group of engineers, technicians, and workforce .
5. Competence in the use of the latest tools and techniques in mechatronics practice and the ability to effectively communicate resulting technical and professional information in written, oral, and visual formats.
6. Design, operation and maintenance of Multidisciplinary Intelligent mechatronics systems, and automation, verifying their performance and solving their basic operational problems.

To judge the compatibility of program mission with its objectives, the following matrix is used:

Key Words of Program Mission / Program Objectives	Prepare a graduate with competencies and problem-solving skills	Competition in regional labor markets	Produce scientific research	Distinguished community participation	Human and moral values
Objective #1	√				
Objective #2	√			√	
Objective #3	√				
Objective #4	√				
Objective #5	√		√		
Objective #6	√	√	√		

6. Graduate Attributes:

1. Master a wide spectrum of engineering knowledge and specialized skills and can apply acquired knowledge using theories and abstract thinking in real life situations.
2. Apply analytic critical and systemic thinking to identify, diagnose and solve engineering problems with a wide range of complexity and variation.
3. Behave professionally and adhere to engineering ethics and standards.
4. Work in and lead a heterogeneous team of professionals from different engineering specialties and assume responsibility for own and team performance
5. Recognize his/her role in promoting the engineering field and contribute in the development of the profession and the community.
6. Value the importance of the environment, both physical and natural, and work to promote sustainability principles.
7. Use techniques, skills and modern engineering tools necessary for engineering practice.
8. Assume full responsibility for own learning and self-development, engage in lifelong learning and demonstrate the capacity to engage in post- graduate and research studies.
9. Communicate effectively using different modes, tools and languages with various audiences; to deal with academic/professional challenges in a critical and creative manner.
10. Demonstrate leadership qualities, business administration and entrepreneurial skills.
11. Use of mathematics, physical science and systems analysis tools in components and system design.

12. Students will learn engineering sciences and demonstrate the application of this knowledge to electro-mechanical systems.
13. Solve problems in the areas of integrated mechanics, electronics, computers and software systems.
14. Analyze and investigate the inter-disciplinary characteristics of mechanical, electrical and hydraulic systems.
15. Graduates should have wide choices leading to specialization in mechanics, electronics, design, computer software or other areas

7. Program Competencies:

According to the National Academic Reference Standard, the program in Mechanical Design and Production Engineering must satisfy the following Competencies:

1- General Engineering NARS Competencies in 2018		
Level A (NARS)	A.1	Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.
	A.2	Develop and conduct appropriate experimentation and/or simulation, analyze and interpret data, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.
	A.3	Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the discipline and within the principles and contexts of sustainable design and development.
	A.4	Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.
	A.5	Practice research techniques and methods of investigation as an inherent part of learning.
	A.6	Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.
	A.7	Function efficiently as an individual and as a member of multi-disciplinary and multi- cultural teams.
	A.8	Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.
	A.9	Use creative, innovative and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.

	A.10	Acquire and apply new knowledge; and practice self, lifelong and other learning strategies.
2- Mechanical NARS		
Level B (NARS)	B.1	Model, analyze and design physical systems applicable to the specific discipline by applying the concepts of Thermodynamics, Heat Transfer, Fluid Mechanics, solid Mechanics, Material Processing, Material Properties, Measurements, Instrumentation, Control Theory and Systems, Mechanical Design and Analysis, Dynamics and Vibrations.
	B.2	Plan, manage and carry out designs of mechanical systems and machine elements using appropriate materials both traditional means and computer-aided tools and software contemporary to the mechanical engineering field.
	B.3	Select conventional mechanical equipment according to the required performance.
	B.4	Adopt suitable national and international standards and codes, integrate legal, economic and financial aspects to design, build, operate, inspect and maintain mechanical equipment and systems.

3- Mechatronics ARS		
Level D (ARS)	D.1	Masterthe ability to apply technological knowledge, electronic theories and software and connect them to find solutions for mechatronics systems, especially problems of manufacturing, maintenance and interaction in a creative way, taking into account industrial and commercial restrictions and developing new products.
	D.2	Design and computation of mechanical and electronic circuit designs and software development for smart products.
	D.3	Use the practical systems approach to design mechatronic systems and evaluate their performance.
	D.4	Define and apply principles of sustainable design and development.
	D.5	Master the ability to carry out development projects independently and in teams.

To judge the compatibility of program objectives with its competencies, the following matrix is used:

Program Objectives	Program Competencies																		
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	D 1	D 2	D 3	D 4	D 5
Objective #1	√	√	√	√					√		√	√	√	√	√			√	
Objective #2	√	√	√						√		√	√	√		√	√	√	√	
Objective #3					√				√					√	√		√	√	
Objective #4				√		√				√					√				
Objective #5								√						√					
Objective #6						√	√												√

PROGRAM REQUIREMENTS

Mechatronics Engineering Program Requirements

#	Requirements	Contact Hours	%	% according to reference framework
1	Humanities & Social Science	20	8	8-12
2	Mathematics & Basic Sciences	64	25.6	20-26
3	Basic Engineering Science	70	28	25-30
4	Applied Engineering and Design	72	28.8	25-30
5	Business Administration	7	2.8	2-4
6	Engineering Knowledge	7	2.8	3-6
7	Projects &Training	10	4	3-6
		250	100	100

#	Subjects	Contact Hours	%	Min. Percentage according to reference framework (%)
1	University Requirements	20	8	8
2	Faculty Requirements	70	28	20
3	Major Specialization Subjects	94	37.6	35
4	Minor Specialization Subjects	66	26.4	Maximum 30
		250	100	

LIST OF COURSES MECHATRONICS ENGINEERING PROGRAM

No.	Code	Course	Contact Hrs				Credit Hours
			Lec.	Tut.	Lab.	Total	
University Requirements (12+7+1=20 Contact Hours) = (12 Credit Hours)							
1	GEN0x0	Elective - Language requirements List	2	0	0	2	2
2	GEN011	Computer Skills	1	0	1	2	1
3	GEN012	History of Engineering & Technology	2	0	0	2	2
4	GEN9xx	Elective - University Requirements list	1	1	0	2	1
5	GEN9xx	Elective - University Requirements list	1	1	0	2	1
6	GEN9xx	Elective - University Requirements list	1	1	0	2	1
7	GEN9xx	Elective - University Requirements list	1	1	0	2	1
8	GEN9xx	Elective - University Requirements list	1	1	0	2	1
9	GEN9xx	Elective - University Requirements list	1	1	0	2	1
10	GEN9xx	Elective - University Requirements list	1	1	0	2	1
Faculty Requirements (22+ 22+26 =70 Contact Hours) = (40 Credit Hours)							
1	BAS010	Differential Calculus and Algebra	2	2	0	4	3
2	BAS011	Statics	2	1	2	5	3
3	BAS012	Engineering Chemistry	2	1	2	5	3
4	BAS013	Physics of Materials & Electricity	2	1	3	6	1
5	MEC010	Engineering Drawing (1)	0	3	0	3	3
6	BAS014	Integral Calculus & Analytical Geometry	2	2	0	4	3
7	BAS015	Dynamics	2	1	2	5	3
8	BAS016	Physics of Light, Heat and Magnetism	2	1	2	5	3
9	MEC011	Principles of Manufacturing Engineering	1	0	2	3	2
10	MEC012	Engineering Drawing (2)	0	3	1	4	2
11	MEC210	Engineering Economy & Accounting	2	2	0	4	3
12	MEC113	Mechanics & Testing of Materials	2	1	2	5	3
13	BAS112	Differential Equations	2	2	0	4	3
14	MEC414	Feasibility Study of Engineering Projects	1	2	0	3	2
15	MEC490	Graduation Project	0	0	10	10	3
16	MEC100	Summer Training	0	0	0	0	0
17	MEC200	Field Training (1)	0	0	0	0	0
18	MEC300	Field Training (2)	0	0	0	0	0
Major Specialization Subjects (37+34+23=94 Contact Hours) = (59 Credit Hours)							
1	MEC110	Mechanical Drawing	1	3	0	4	2
2	ELE170	Electrical Engineering	2	2	0	4	3
3	MEC111	Materials Science	1	1	3	5	2
4	BAS110	Statistics & Theory of Probability	2	2	0	4	3
5	BAS111	Engineering Mechanics	1	3	0	4	2
6	MEC112	Manufacturing Technology (1)	2	1	1	4	3
7	MEC120	Thermodynamics	2	2	1	5	3
8	MEC121	Fluid Mechanics (1)	2	1	2	5	3
9	MEC102	Engineering Mathematics Using Computer	1	0	3	4	2
10	MEC201	Theory of Measurements & Sensors	1	1	3	5	2
11	BAS211	Numerical Analysis	2	2	0	4	3

12	MEC211	Kinematics & Dynamics of Rigid Bodies	2	2	1	5	3
13	MEC212	Manufacturing Technology (2)	2	1	2	5	3
14	MEC213	Mechanical Design (1)	2	4	0	6	4
15	MEC220	Heat Transfer	2	1	2	5	3
16	MEC214	Mechanical Vibrations	2	2	0	4	3
17	ELE270	Electrical Machines	2	1	1	4	3
18	MEC221	Fluid Mechanics (2)	2	1	1	4	3
19	MEC320	Hydraulic & Pneumatic Systems	2	0	3	5	3
20	MEC330	System Dynamics	2	2	0	4	3
21	MEC331	Automatic Control	2	2	0	4	3
Minor Specialization Subjects (24+15+27=66 Contact Hours) = (38 Credit Hours)							
1	ELE380	Logic Circuits	1	1	2	4	2
2	MEC332	Design & Analysis of Mechatronic Systems	2	1	2	5	3
3	MEC333	Advanced Measurements in Mechatronics	1	1	2	4	2
4	MEC329	Embedded Systems Programming & Computer Interfacing	2	2	2	6	4
5	ELE383	Signal Analysis & Digital Signals	2	2	1	5	3
6	ELE382	Power Electronics & driving Systems	2	0	2	4	3
7	MEC381	Electronics Engineering for Mechatronics	2	1	2	5	3
8	MEC430	Computer Aided Design & Manufacturing (CAD/CAM)	1	0	4	5	2
9	MEC431	Robot Control	1	0	4	5	2
10	MEC432	Programmable Logic Control & Supervisory Control	2	2	1	5	3
11	MEC433	Industrial Processes Control	2	1	1	4	3
12	MEC4xx	Elective (1)	1	2	1	4	2
13	MEC4xx	Elective (2)	1	2	1	4	2
14	MEC4xx	Elective (3)	2	0	1	3	2
15	MEC4xx	Elective (4)	2	0	1	3	2

COURSES CLASSIFICATION MECHATRONICS ENGINEERING PROGRAM

No.	Code	Course	Contact Hrs			
			Lec.	Tut.	Lab.	Total
Humanities & Social Science Subjects (12+7+1=20 Contact Hours)						
1	GEN0x0	Elective - Language requirements List	2	0	0	2
2	GEN011	Computer Skills	1	0	1	2
3	GEN012	History of Engineering & Technology	2	0	0	2
4	GEN9xx	Elective - University Requirements list	1	1	0	2
5	GEN9xx	Elective - University Requirements list	1	1	0	2
6	GEN9xx	Elective - University Requirements list	1	1	0	2
7	GEN9xx	Elective - University Requirements list	1	1	0	2
8	GEN9xx	Elective - University Requirements list	1	1	0	2
9	GEN9xx	Elective - University Requirements list	1	1	0	2
10	GEN9xx	Elective - University Requirements list	1	1	0	2
Mathematics & Basic Sciences (25+21+18=64 Contact Hours)						
1	BAS010	Differential Calculus and Algebra	2	2	0	4
2	BAS011	Statics	2	1	2	5
3	BAS012	Engineering Chemistry	2	1	2	5
4	BAS013	Physics of Materials & Electricity	2	1	3	6
5	BAS014	Integral Calculus & Analytical Geometry	2	2	0	4
6	BAS015	Dynamics	2	1	2	5
7	BAS016	Physics of Light, Heat and Magnetism	2	1	2	5
8	BAS110	Statistics & Theory of Probability	2	2	0	4
9	BAS111	Engineering Mechanics	1	3	0	4
10	BAS112	Differential Equations	2	2	0	4
11	BAS211	Numerical & Complex Analysis	2	2	0	4
12	MEC111	Materials Science	1	1	3	5
13	MEC102	Engineering Mathematics Using Computer	1	0	3	4
14	MEC211	Kinematics & Dynamics of Rigid Bodies	2	2	1	5
Business Administration (3+4+0=7 Contact Hours)						
1	MEC210	Engineering Economy & Accounting	2	2	0	4
2	MEC414	Feasibility Study of Engineering Projects	1	2	0	3
Engineering Knowledge Subjects (3+3+2=7 Contact Hours)						
1	MEC011	Principles of Manufacturing Engineering	1	0	2	3
2	ELE170	Electrical Engineering	2	2	0	4
Basic Engineering Science Subjects (24+24+22=70 Contact Hours)						
1	MEC010	Engineering Drawing (1)	0	3	0	3
2	MEC012	Engineering Drawing (2)	0	3	1	4
3	MEC110	Mechanical Drawing	1	3	0	4
4	MEC113	Mechanics & Testing of Materials	2	1	2	5
5	MEC120	Thermodynamics	2	2	1	5
6	MEC121	Fluid Mechanics (1)	2	1	2	5
7	MEC201	Theory of Measurements & Sensors	1	1	3	5
8	MEC220	Heat Transfer	2	1	2	5
9	MEC214	Mechanical Vibrations	2	2	0	4
10	ELE270	Electrical Machines	2	1	1	4

11	MEC221	Fluid Mechanics (2)	2	1	1	4
12	MEC320	Hydraulic & Pneumatic Systems	2	0	3	5
13	MEC330	System Dynamics	2	2	0	4
14	MEC333	Advanced Measurements in Mechatronics	1	1	2	4
15	ELE 381	Electronics Engineering for Mechatronics	2	1	2	5
16	ELE380	Logic Circuits	1	1	2	4
Applied Engineering and Design Subjects (28+20+24=72 Contact Hours)						
1	MEC112	Manufacturing Technology (1)	2	1	1	4
2	MEC212	Manufacturing Technology (2)	2	1	2	5
3	MEC213	Mechanical Design (1)	2	4	0	6
4	MEC331	Automatic Control	2	2	0	4
5	MEC332	Design & Analysis of Mechatronic Systems	2	1	2	5
6	MEC329	Embedded Systems Programming & Computer Interfacing	2	2	2	6
7	MEC433	Industrial Processes Control	2	1	1	4
8	ELE383	Signal Analysis & Digital Signals	2	2	1	5
9	ELE382	Power Electronics & driving Systems	2	0	2	4
10	MEC430	Computer Aided Design & Manufacturing (CAD/CAM)	1	0	4	5
11	MEC431	Robot Control	1	0	4	5
12	MEC432	Programmable Logic Control & Supervisory Control	2	2	1	5
13	MEC4xx	Elective (1)	1	2	1	4
14	MEC4xx	Elective (2)	1	2	1	4
15	MEC4xx	Elective (3)	2	0	1	3
16	MEC4xx	Elective (4)	2	0	1	3
Projects and Field Training Subjects (0+0+10=10 Contact Hours)						
2	MEC490	Graduation Project	0	0	10	10
3	MEC100	Summer Training	0	0	0	0
4	MEC200	Field Training (1)	0	0	0	0
5	MEC300	Field Training (2)	0	0	0	0

STUDY PLANS

PREPARATORY YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		33Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
BAS010	Differential Calculus and Algebra	2	2	0	4	60	0	60	120	3
BAS011	Statics	2	1	2	5	45	30	75	150	3
BAS012	Engineering Chemistry	2	1	2	5	45	30	75	150	3
BAS013	Physics of Materials & Electricity	2	1	3	6	45	45	90	180	3
MEC010	Engineering Drawing (1) ×	0	3	0	3	25	20	60	90	3
GEN0x0	Elective - Language requirements List	2	0	0	2	30	0	30	60	2
		10	**8**	**7**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
BAS014	Integral Calculus & Analytical Geometry	2	2	0	4	60	0	60	120	3
BAS015	Dynamics	2	1	2	5	45	30	75	150	3
BAS016	Physics of Light, Heat and Magnetism	2	1	2	5	45	30	75	150	3
MEC011	Principles of Manufacturing Engineering†	1	0	2	3	25	20	45	90	3
MEC012	Engineering Drawing (2) ×	0	3	1	4	30	30	60	120	3
GEN011	Computer Skills ×	1	0	1	2	15	15	30	60	2
GEN012	History of Engineering & Technology	2	0	0	2	30	0	30	60	2
		10	**7**	**8**	**25**				**750**	

† In workshops, students are divided into groups 15 students/each, and a faculty stuff member (or an assistant) as well as a practical trainer will teach the group.

× In exercises, students are divided into groups 15 students/each. Two faculty stuff members or their assistants will teach each group.

FIRST YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
MEC110	Mechanical Drawing *×	1	3	0	4	60	0	60	120	4
ELE170	Electrical Engineering	2	2	0	4	60	0	60	120	3
MEC111	Materials Science	1	1	3	5	45	30	75	150	3
BAS110	Statistics & Theory of Probability	2	2	0	4	60	0	60	120	3
BAS111	Engineering Mechanics	1	3	0	4	60	0	60	120	3
MEC112	Manufacturing Technology (1)†	2	1	1	4	30	30	60	120	3
		9	**12**	**4**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
MEC120	Thermodynamics	2	2	1	5	45	30	75	150	3
BAS112	Differential Equations	2	2	0	4	60	0	60	120	3
MEC121	Fluid Mechanics (1)	2	1	2	5	45	30	75	150	3
MEC113	Mechanics & Testing of Materials	2	1	2	5	45	30	75	150	3
MEC102	Computer Aided Engineering Mathematics	1	0	3	4	30	30	60	120	3
GEN9XX	Elective from University Requirements list	1	1	0	2	20	10	30	60	2
		10	**7**	**8**	**25**				**750**	

* Prior to registering in first year, the student should have completed 3 weeks of summer training in "Computer aided mechanical drawing" (MEC100) for 3 weeks in summer for 5 days per week. The daily training is for 5 hours (2 hrs Lecture + 3 hrs tutorial), amounting to a total of 25 hours per week. A maximum grade of 25 marks is added to the 'semester work' grades of the "mechanical drawing" course (MEC110).

× In exercises, students are divided into groups 15 students/each.Two faculty stuff members or teaching assistants teach each group.

† In workshops, students are divided into groups 15 students/each, and a faculty stuff member (or teaching assistants) as well as a practical trainer will teach the group.

*After completing the secondyear, the student undergoes field training -1 (MEC300) for 4 weeks during the summer vacation, in a factory, company, firm or project site …etc in a related field. Every 5 students are supervised by a staff member of the department, (this supervision is not included in the staff member's teaching load).

SECOND YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
MEC210	Engineering Economy & Accounting	2	2	0	4	60	0	60	120	3
MEC201	Theory of Measurements & Sensors	1	1	3	5	45	30	75	150	3
BAS211	Numerical & Complex Analysis	2	2	0	4	60	0	60	120	3
MEC211	Kinematics & Dynamics of Rigid Bodies	2	2	1	5	45	30	75	150	3
MEC212	Manufacturing Technology (2)†	2	1	2	5	45	30	75	150	3
GEN9XX	Elective from University Requirements list	1	1	0	2	20	10	30	60	2
		11	**8**	**6**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
MEC213	Mechanical Design (1)	2	4	0	6	60	30	90	180	4
MEC220	Heat Transfer	2	1	2	5	45	30	75	150	3
MEC214	Mechanical Vibrations	2	2	0	4	60	0	60	120	3
ELE270	Electrical Machines	2	1	1	4	40	20	60	120	3
MEC221	Fluid Mechanics (2)	2	1	1	4	40	20	60	120	3
GEN9XX	Elective from University Requirements list	1	1	0	2	20	10	30	60	2
		11	**10**	**4**	**25**				**750**	

† In workshops, students are divided into groups 15 students/each, and a faculty stuff member (or teachingassistant) as well as a practical trainer teach the group.

*After completing the second year, the student undergoes field training -1 (MEC300) for 4 weeks during the summer vacation, in a factory, company, firm or project site …etc in a related field. Every 5 students are supervised by a staff member of the department, (this supervision is not included in the staff member's teaching load).

THIRD YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
MEC320	Hydraulic & Pneumatic Systems	2	0	3	5	40	30	70	140	3
MEC330	System Dynamics	2	2	0	4	60	0	60	120	3
ELE380	Logic Circuits	1	1	2	4	30	30	60	120	3
MEC332	Design & Analysis of Mechatronic Sys.	2	1	2	5	40	30	70	140	3
ELE381	Electronics Eng. for Mechatronics	2	1	2	5	40	30	70	140	3
GEN9XX	Elective from University Requirements list	1	1	0	2	20	10	30	60	2
MEC300	Field Training (1) *	0	0	0	0	15	15	0	30	-
		10	**5**	**10**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
MEC331	Automatic Control	2	2	0	4	60	0	60	120	3
MEC329	Embedded Systems Programming & Computer Interfacing	2	2	2	6	45	45	90	180	3
ELE383	Signal Analysis & Digital Signals	2	2	1	5	45	30	75	150	3
ELE382	Power Electronics &Driving Systems	2	0	2	4	30	30	60	120	3
MEC333	Adv. Measurements in Mechatronics	1	1	2	4	30	30	60	120	3
GEN9XX	Elective from University Requirements list	1	1	0	2	20	10	30	60	2
		11	**7**	**7**	**25**				**750**	

* After completing the third year, the student undergoes field training -2 (mec400) for 4 weeks during the summer vacation, in a factory, company, firm or project site …etc in a related field. Every 5 students are supervised by a staff member of the department, (this supervision is not included in the staff member's teaching load).

FOURTH YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
MEC430	CAD/CAM	1	0	4	5	40	30	70	140	3
MEC431	Robot Control	1	0	4	5	40	30	70	140	3
MEC432	Prog. Logic Controllers& Super. Control	2	2	1	5	40	30	70	140	3
MEC4xx	Elective (1)	1	2	1	4	30	30	60	120	3
MEC4xx	Elective (2)	1	2	1	4	30	30	60	120	3
GEN9XX	Elective from University Requirements list	1	1	0	2	20	10	30	60	2
MEC400	Field Training (2)	0	0	0	0	15	15	0	30	-
		7	**7**	**11**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
MEC414	Feasibility Study of Eng. Projects	1	2	0	3	45	0	45	90	3
MEC433	Industrial Processes Control	2	1	1	4	60	0	60	120	3
MEC4xx	Elective (3)	2	0	1	3	45	0	45	90	3
MEC4xx	Elective (4)	2	0	1	3	45	0	45	90	3
GEN9XX	Elective from University Requirements list	1	1	0	2	20	10	30	60	2
MEC490	Graduation Project *	0	0	10	10	180	120	0	300	-
		9	**3**	**13**	**25**				**750**	

* After completing the second semester, the students are divided into groups and continue performing the graduation project for 4 weeks.

LIST OF TECHNICAL LANGUAGES ELECTIVE COURSES

#	Code	Contact Hours	Contact Hrs			
			Lec.	Tut.	Lab.	Total
1	GEN010	English Language	2	0	0	2
2	GEN020	German Language	2	0	0	2
3	GEN030	French Language	2	0	0	2

LIST OF ELECTIVE COURSES FROM UNIVERSITY REQUIREMENTS

#	Code	Contact Hours	Contact Hrs			
			Lec.	Tut.	Lab.	Total
1	GEN900	Communication & Presentation Skills	1	1	0	2
2	GEN901	Theory of Sustainability	1	1	0	2
3	GEN902	Human Rights and Combating Corruption	1	1	0	2
4	GEN903	Research & Analysis Skills	1	1	0	2
5	GEN904	Entrepreneurship	1	1	0	2
6	GEN905	Professional Ethics	1	1	0	2
7	GEN906	Critical Thinking	1	1	0	2
8	GEN907	Human Resources Management	1	1	0	2
9	GEN908	Contracts and Legislation	1	1	0	2
10	GEN909	Method of Scientific Research and Writing	1	1	0	2

LIST OF ELECTIVE COURSES FOR MECHATRONICS ENGINEERING PROGRAM

#	Code	Contact Hours	Contact Hrs			
			Lec.	Tut.	Lab.	Total
List (1) of Elective Courses						
1	ELE480	Advanced Electronic Circuits	1	2	1	4
2	ELE470	Advanced Electrical Circuits	1	2	1	4
3	ELE471	Advanced Electrical Drive Systems	1	2	1	4
List (2) of Elective Courses						
1	MEC460	Computer Applications in Mechatronics	1	2	1	4
2	MEC461	Artificial Intelligence Control	1	2	1	4
List (3) of Elective Courses						
1	MEC462	OptimalControl	2	0	1	3
2	MEC463	Discrete Control	2	0	1	3
3	MEC464	Nonlinear Control	2	0	1	3
List (4) of Elective Courses						
1	MEC465	Application of Mechatronics in Automotive	2	0	1	3
2	MEC466	Mechatronics Applications in building Energy Management	2	0	1	3
3	MEC467	Autonomous control	2	0	1	3
4	MEC468	Microelectromechanical Systems	2	0	1	3
5	MEC469	Advanced Industrial Robotic Systems	2	0	1	3

MECHARONICS ENGINEERING PROGRAM TREE

	List (1) of Elective Courses	List (2) of Elective Courses	List (3) of Elective Courses	List (4) of Elective Courses

Elective Courses	ELE480 **Advanced Electronic Circuits**	ELE470 **Advanced Electrical Circuits**	ELE471 **Advanced Electrical Drive Systems**	MEC460 **Computer Applications in Mechatronics**	MEC461 **Artificial Intelligence Control**	MEC462 **Optimal Control**	MEC463 **Discrete Control**	MEC464 **Nonlinear Control**	MEC465 **Application of Mechatronics in Automotive**	MEC466 **Mechatronics Applications in building Energy Management**	MEC467 **Autonomous control**	MEC468 **Microelectro mechanical Systems**	MEC469 **Advanced Industrial Robotic Systems**
Prerequisite	ELE380 **Logic Circuits**			BAS211 **Numerical & Complex Analysis**	MEC329 **Embedded Systems Programmin g**	MEC331 **Automatic Control**	MEC331 **Automatic Control**	MEC331 **Automatic Control**	MEC432 **Prog. Logic Controllers & Super. Control**		MEC461 **Artificial Intelligen ce Control**	MEC432 **Prog. Logic Controllers & Super. Control**	MEC431 **Robot Control**

FOURTH YEAR	MEC430 **CAD/CAM**	MEC431 **Robot Control**	MEC432 **Prog. Logic Controllers & Super. Control**	MEC4xx **Elective (1)**	MEC4xx **Elective (2)**	GEN9XX Elective GEN	MEC414 **Feasibility Study of Eng. Projects**	MEC433 **Industrial Processes Control**	MEC4xx **Elective (3)**	MEC4xx **Elective (4)**	GEN9XX Elective GEN	MEC490 **Graduation Project ***
Prerequisite	MEC213 **Mechanical Design (1)**	MEC331 **Automatic Control**	ELE380 **Logic Circuits**				MEC210 **Engineering Economy & Accounting**	MEC331 **Automatic Control**				

THIRD YEAR	MEC320 **Hydraulic & Pneumatic Systems**	MEC330 **System Dynamics**	ELE380 **Logic Circuits**	MEC332 **Design & Analysis of Mechatronic Sys.**	MEC333 **Adv. Measureme nts in Mechatronic s**	GEN9XX Elective GEN	MEC300 **Field Training (2)**	MEC331 **Automatic Control**	MEC329 **Embedded Systems Programmin g**	ELE383 **Signal Analysis & Digital Signals**	ELE382 **Power Electronics & Driving Systems**	MEC328 **Computer Interfacing & Algorithms**	GEN9XX Elective GEN

Benha University

MECHATRONICS ENGINEERING PROGRAM 2021

Faculty of Engineering at Shoubra

Prerequisite	MEC221 **Fluid Mechanics (2)**	MEC214 **Mechanical Vibrations**	ELE170 **Electrical Engineering**	MEC213 **Mechanical Design (1)**	MEC201 **Theory of Measurements & Sensors**		MEC200 **Field Training (1**	MEC330 **System Dynamics**	MEC332 **Design & Analysis of Mechatronic Sys.**	ELE380 **Logic Circuits**	ELE270 **Electrical Machines**	ELE380 **Logic Circuits**	

SECOND YEAR	MEC210 **Engineering Economy & Accounting**	MEC201 **Theory of Measurements & Sensors**	BAS211 **Numerical & Complex Analysis**	MEC211 **Kinematics & Dynamics of Rigid Bodies**	MEC212 **Manufacturing Technology (2)**	GEN9XX Elective GEN	MEC200 **Field Training (1)**	MEC213 **Mechanical Design (1)**	MEC220 **Heat Transfer**	MEC214 **Mechanical Vibrations**	ELE270 **Electrical Machines**	MEC221 **Fluid Mechanics (2)**	GEN9XX Elective GEN
Prerequisite		MEC201 **Theory of Measurements & Sensors**	BAS112 **Differential Equations**	MEC211 **Kinematics & Dynamics of Rigid Bodies**	MEC112 **Manufacturing Technology (1)**	GEN9XX Elective GEN	MEC200 **Field Training (1)**	MEC113 **Mechanics & Testing of Materials**	MEC120 **Thermodynamics**	BAS111 **Engineering Mechanics**	ELE170 **Electrical Engineering**	MEC121 **Fluid Mechanics (1)**	

FIRST YEAR	MEC110 **Mechanical Drawing**	ELE170 **Electrical Engineering**	MEC111 **Materials Science**	BAS110 **Statistics & Theory of Probability**	BAS111 **Engineering Mechanics**	MEC112 **Manufacturing Technology (1)**	MEC120 **Thermodynamics**	BAS112 **Differential Equations**	MEC121 **Fluid Mechanics (1)**	MEC113 **Mechanics & Testing of Materials**	MEC102 **Computer Aided Engineering Mathematics**	GEN9XX Elective GEN
Prerequisite	MEC012 **Engineering Drawing (2) ×**	BAS013 **Physics of Materials & Electricity**	MEC111 **Materials Science**		BAS011 **Statics** BAS014 **Dynamics**	MEC011 **Principles of Man. Technology**	BAS016 **Physics of Light, Heat and Magnetism**	BAS014 **Integral Calculus & Analytical Geometry**	BAS013 **Physics of Materials & Electricity**	MEC111 **Materials Science** BAS111 **Engineering Mechanics**	GEN011 **Computer Skills ×**	

PREPARATORY YEAR	BAS010 Differential Calculus and Algebra	BAS011 Statics	BAS012 Engineering Chemistry	BAS013 Physics of Materials & Electricity	MEC010 Engineering Drawing (1) ×	GEN010 Technical English Language	BAS014 Integral Calculus & Analytical Geometry	BAS014 Dynamics	BAS016 Physics of Light, Heat and Magnetism	MEC011 Principles of Man. Technology	MEC012 Engineering Drawing (2) ×	GEN011 Computer Skills ×	GEN012 History of Engineering & Technology
Prerequisite							BAS010 Differential Calculus and Algebra	BAS011 Statics	BAS013 Physics of Materials & Electricity		MEC010 Engineering Drawing (1) ×		

Program Matrix (Relating the program courses with competencies)

Course Code	Course Name	Engineering Competencies (2018)										"Department" Mechanical Engineering Competencies (NARS)				"Discipline" Mecharonics Engineering Competencies (ARS)				
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	C1	C2	C3	C4	C5
BAS010	Differential Calculus and Algebra	√							√											
BAS011	Statics	√							√											
BAS012	Engineering Chemistry	√							√											
BAS013	Physics of Materials & Electricity	√		√					√											
MEC010	Engineering Drawing (1) ×			√					√							√				
GEN010	Technical Language (English or Germany)	√		√					√											
BAS014	Integral Calculus & Analytical Geometry	√							√											
BAS015	Dynamics	√							√											
BAS016	Physics of Light, Heat and	√							√											

Course Code	Course Name	Engineering Competencies (2018)										“Department” Mechanical Engineering Competencies (NARS)				“Discipline” Mecharonics Engineering Competencies (ARS)				
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	C1	C2	C3	C4	C5
	Magnetism																			
MEC011	Production Technology & †Workshops		√	√	√							√	√							
MEC012	Engineering Drawing (2) ×			√					√		√					√				
GEN011	Computer Skills ×	√			√				√											
GEN012	History of Engineering & Technology	√		√					√	√										
MEC110	Mechanical Drawing *×			√			√							√	√	√				
ELE170	Electrical Engineering						√					√				√				
MEC111	Materials Science				√			√					√							
BAS110	Statistics & Theory of Probability		√						√			√						√		
BAS111	Engineering Mechanics	√			√	√		√				√	√							
MEC112	† Manufacturing Technology (1)			√	√		√		√					√	√		√	√		
MEC120	Thermodynamics																			
BAS112	Differential Equations	√							√											
MEC121	Fluid Mechanics (1)							√	√			√	√							
MEC113	Mechanics & Testing of Materials		√		√															
MEC102	Engineering Math. Using Computer	√							√											
GEN900	Communication & Presentation Skills							√		√										
MEC210	Engineering Economy & Accounting			√	√						√									

Course Code	Course Name	Engineering Competencies (2018)										"Department" Mechanical Engineering Competencies (NARS)				"Discipline" Mecharonics Engineering Competencies (ARS)				
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	C1	C2	C3	C4	C5
MEC201	Theory of Measurements & Sensors		√									√					√			
BAS211	Numerical & Complex Analysis	√							√			√				√				
MEC211	Kinematics & Dynamics of Rigid Bodies	√	√									√	√						√	
MEC212	†Manufacturing Technology (2)			√			√						√	√			√			
GEN902	Human Rights and Combating Corruption	√			√								√							
MEC213	Mechanical Design (1)			√			√						√	√			√			
MEC220	Heat Transfer							√	√			√	√							
MEC214	Mechanical Vibrations		√									√					√			
ELE270	Electrical Machines		√	√				√								√				
MEC221	Fluid Mechanics (2)							√	√			√	√							
GEN903	Research & Analysis Skills	√			√	√														
MEC320	Hydraulic & Pneumatic Systems		√				√	√					√			√	√			
MEC330	System Dynamics	√		√			√					√				√				
ELE380	Logic Circuits		√				√						√			√	√			
MEC332	Design & Analysis of Mechatronic Sys.	√			√							√				√				
ELE381	Electronics Engineering for Mechatronics	√																		

Course Code	Course Name	Engineering Competencies (2018)										“Department” Mechanical Engineering Competencies (NARS)				“Discipline” Mecharonics Engineering Competencies (ARS)				
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	C1	C2	C3	C4	C5
GEN904	Entrepreneurship	√					√		√											
MEC300	Field Training (1)								√	√				√	√					
MEC331	Automatic Control						√						√		√					√
MEC329	Embedded Systems Programming and Computer Interfacing	√			√														√	√
ELE383	Signal Analysis & Digital Signals	√							√			√				√				
ELE382	Power Electronics &Driving Systems	√		√								√								
MEC333	Adv. Measurements in Mechatronics	√							√			√				√				
GEN905	Professional Ethics	√						√				√								
MEC430	CAD/CAM		√			√						√								
MEC431	Robot Control	√							√			√				√				
MEC432	Prog. Logic Controllers& Super. Control		√				√					√	√				√			
MEC4xx	Elective (1)		√							√		√								
MEC4xx	Elective (2)		√							√		√								
GEN906	Critical Thinking			√	√				√				√			√				
MEC400	Field Training (2)	√			√							√								
MEC414	Feasibility Study of Eng. Projects			√			√			√		√							√	√
MEC433	Industrial Processes Control		√				√						√			√	√			
MEC4xx	Elective (3)	√					√					√	√				√			

Course Code	Course Name	Engineering Competencies (2018)										"Department" Mechanical Engineering Competencies (NARS)				"Discipline" Mecharonics Engineering Competencies (ARS)				
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	C1	C2	C3	C4	C5
MEC4xx	Elective (4)	√				√	√					√	√				√			
GEN907	Human Resources Management				√	√	√		√	√	√									
MEC490	Graduation Project *		√	√				√		√			√	√	√		√	√	√	√
Elective Courses																				
ELE480	Advanced Electronic Circuits						√						√		√					√
ELE470	Advanced Electrical Circuits						√						√		√					√
ELE471	Advanced Electrical Drive Systems						√						√		√					√
MEC460	Computer Applications in Mechatronics						√						√		√					√
MEC461	Artificial Intelligence Control	√							√			√				√				
MEC462	Optimal Control	√							√			√	√			√		√		
MEC463	Discrete Control	√							√			√	√			√		√		
MEC464	Nonlinear Control	√							√			√	√			√		√		
MEC465	Application of Mechatronics in Automotive			√	√									√	√	√				
MEC466	Mechatronics Applications in building Energy Management			√	√									√	√					

Courses Description

PREPARATORY YEAR

BAS010 Differential Calculus and Algebra (2,2,0)

Differentiation: Elementary functions, Polynomials, Exponential, Logarithmic, and trigonometric functions, Limits and continuity, Derivative, Implicit differentiation, Maximum and minimum values, Mean value theorem, Taylor's expansion, Integration of Polynomials, Exponential and trigonometric functions, Definite integral.

Algebra: Matrices, Algebra of matrices, Eigenvalues and eigenvectors, Positive and negative matrices, Linear systems, Finite series, Complex numbers, Mathematical induction.

References:

1- Basic Technical Mathematics with Calculus Kindle Edition, Pearson; 11th Edition, 2017.
2- Textbook of Basic Mathematics: A Beginner's Guide To Geometry, Trigonometry and Calculus KindleEdition,, 2017.

BAS011 Statics (2,1,2)

Application on space vectors, resultant of a set of forces, moments, equivalent couple moment, equations of equilibrium for rigid body, types of supports, statically determinate beams and trusses, equilibrium under influence of spatial forces and couples, center of mass (for particles and planer surface), moment of inertia (parallel axes, major axes, planer surface).

References:

1- Engineering Mechanics: Statics & Dynamics by Russell Hibbeler,Pearson; 14th Edition, 2015.

BAS012 Engineering Chemistry (2,1,2)

Gaseous state (gases law), chemical equilibrium and Le Chatellier,principle –solutions- phase diagram- basics of water treatment anddesalination technology- Introduction on thermo chemistry and its rules,basics of fuel combustion, calorimetric and determination of heat ofcombustion –Electrochemistry and conduction in electrolytic solutionsElectrochemical cells and Nernst equation- Corrosion of metals (types,methods of prevention of corrosion – ionic equilibrium and pHcalculation- building materials and some petrochemicals industry.

References:

1- Engineering Chemistry: Alpha Science; Illustrated Edition, 2018

BAS013 Physics of Materials & Electricity (2,1,3)

Properties of matter : Physical quantities, standard units and dimensions, atomic structure (electronic distribution, classification of elements and energy levels), crystalline structure (crystalline grid, symmetry, vacuum groups, some simple examples of crystalline structure), stress and strain, mechanical properties of materials (tensile strength and yield stress, etc.,) Physical properties of liquids, viscosity, surface tension, Archimedes principles, Pascal's law, Bernoulli'sequation and their applications. Laboratory experiments. Electrical: charge and matter, Coulomb's law, electric field, Gauss's law, electric potential, capacitors and dielectric materials, electrical resistance and electromotive force, Ohm's law, simple electrical circuit, laboratory experiments.

References:

1- Modern Classical Physics: Optics, Fluids, Plasmas, Elasticity, Relativity, and Statistical Physicsby Kip S. Thorne , Princeton University Press, 2017.
2- Basic Physics: A Self-Teaching Guide by K Kuhn, Noah Books, 2018

BAS014 Integral Calculus and Analytical Geometry (2,2,0)

Integration: Hyperbolic functions and inverse functions and their derivatives, derivatives of parametric relations, Methods of integrations, integration by partial fractions, parts, reduction and substitution, Applications of definite integrals for obtaining plane area, volumes, arc length and surface area.

Analytical geometry: Cartesian and polar coordinates, Equation of pair of lines, Equation of circle, Conic sections and their properties, Equation of plane, Equations of sphere, cone and cylinder.

References:

1- Basic Technical Mathematics with Calculus Kindle Edition, Pearson; 11th Edition, 2017.
2- Textbook of Basic Mathematics: A Beginner's Guide To Geometry, Trigonometry and Calculus KindleEdition,, 2017.

BAS015 Dynamics (2,1,2)

Kinematics of Particle (rectilinear and curvilinear motion, Cartesian coordinates, projectile motion, natural coordinates, polar coordinates, relative motion), kinetics of Particle (acceleration force method), plane kinematics of rigid bodies (translational and rotational motion, general motion: relative velocities, instantaneous center of zero velocity, planer kinetics of rigid body, acceleration forces, work and energy, impact and momentum.

References:

1- Engineering Mechanics: Statics & Dynamics by Russell Hibbeler,Pearson; 14th Edition, 2015.

BAS016 Physics of Light, Heat and Magnetism (2,1,2)

Principles of heat and thermodynamics: Zero law, first and second Law of thermodynamics, heat transfer, gas theory, temperature measurement methods. Light and laser physics: general concepts of light, straight diffusion of light, Velocity of light diffusion, light beam, optical beams, geometric light, reflection and refraction, wave radiation modeling, wave dissipation, diffraction of light, introduction to lasers, Einstein's equations and magnification Light, Explanation of some lasers (gas, solid and liquid lasers), laser applications. Magnetism: magnetic field, Faraday magnetic law, magnetic induction, Boit-savart's law, Ampere's law, laboratory experiments.

References:

1- Modern Classical Physics: Optics, Fluids, Plasmas, Elasticity, Relativity, and Statistical Physicsby Kip S. Thorne , Princeton University Press, 2017.

2- Basic Physics: A Self-Teaching Guide by K Kuhn, Noah Books, 2018

MEC010 Engineering Drawing (1) (0,3,0)

This is an introductory course teaches the basics of technical Drawing using manual drafting instruments. The topics include drawing tools, types of lines, sizes and layout of standard drawing sheets, lettering & numbering, scale use, drawing of geometrical figures, dimensioning, axonometric and isometric views, orthogonal and auxiliary projections, drawing of orthographic projection from isometric view.

References:

1- A Textbook of Engineering Drawing: Along with an Introduction to AutoCAD 2015 by Roop Lal, I K International Publishing House, 2015.

MEC011 Principles of Manufacturing Engineering (1,0,2)

The course introduces the basic concepts of production and productivity. The topics include classification of production processes, industrial safety, engineering materials, ferrous and non-ferrous alloys, steel and its types, cast iron and its types, steel and cast iron production, metal casting processes (sand casting, mold casting, centrifugal casting, wax casting, hot and cold metal forming processes (extrusion, forging, rolling, deep drawing, wire drawing, etc.), metal cutting processes (turning, milling, shaping, drilling, grinding, etc.),metal joining techniques (welding processes, rivets, bolts … etc).Simple workshop measuring tools (Vernier caliper, micrometers, etc.), practical skills in workshops.

References:

1- Workshop Technology (Manufacturing Process) by S. K. Garg, Laxmi Publications; 3rd Revised edition, 2009.

MEC012 Engineering Drawing (2) (0,3,1)

Deduction of the missing orthogonal views, sections in machine members, hatching rules, intersections of solids and surfaces, development of surfaces, drawing of steel structures. Basics of computer aided drafting (CAD) using AutoCAD: Workspace, toolbars, coordinate systems, setting up 2D drawing environment, drawing tools in AutoCAD, object snap, modification tools in AutoCAD, texting and dimensioning in AutoCAD.

References:

1- A Textbook of Engineering Drawing: Along with an Introduction to AutoCAD 2015 by Roop Lal, I K International Publishing House, 2015.

FIRST YEAR

MEC110 Mechanical Drawing (1,3,0)

This course aims to provide the students with basic knowledge on assembly drawings and representation of mechanical components. The topics include: Sections in machine members, Assembly and detailed drawings, Fits and tolerances, Geometrical tolerances, Surface texture and roughness symbols, Welding symbols. The students can Identify the different types of machine elements like gears, shafts and keys, journal bearings, anti-friction bearings, springs, valves, pulleys, pipelines, clutches and breaks ...etc. Applications on assembly drawings of jacks, vices, valves, gearboxes …et care provided. Applications using of 3D modeling software (like SolidWorks or Autodesk Inventor) to draw and assemble machine components to construct a complete complex machine in addition to make detailed drawings.

References

1- Textbook of Engineering Drawing, K. Venkata Reddy, Second Edition, BS Publications, 2008.
2- Machine Drawing – K.L, Narayana, P. Kannaiah, and K. Venkata Redd, New age Int. Publisher, Third Edition.
3- Geometric and Engineering Drawing, Ken Morling, 3rdEdition, 2012.

ELE170 Electrical Engineering (2,2,0)

Electrical circuits basics (resistors –coils- capacitors -Various sources of electrical waves) DC circuits and electrical theories(Kirchhoff - Thevenin - Norton - assembly) - nodes and tracks equations –AC current circuits and phasor diagram to represent it - A balanced and unbalanced 3-phase system–resonance in electrical circuits and frequency domain response–harmonics in electrical circuit.

References

1- James, W. Nilsson, "Electric Circuits " 7th Edition,2009
2- Joseph, A. "Electric Circuits" McGraw-Hill International Book Company, New York ,1972.

MEC111 Materials Science (1,1,3)

Atomic structure, interatomic bonding and structure of crystalline solids, defects in crystalline solids, dislocations and strengthening mechanisms, phase diagrams, iron-carbon phase diagram, , phase transformation and heat treatment of metals, time-temperature-transformation (TTT) diagrams, Steels and its alloys, Cast iron and its alloys, Non-ferrous alloys (aluminum, copper, magnesium, zinc).The structure of polymers, ceramics and composite materials.

References

1- Material science and engineering: an introduction, W.D Callister, Jr., 8thedition.
2- Essentials of Materials Science and Engineering, Donald R. Askeland and Pradeep P. Fulay, 2nd Edition.
3- Materials for engineering, J. W. Martin, 3rdedition

BAS110 Statistics & Theory of Probability (2,2,0)

Descriptive statistics, Statistical classification of data, Measures of central tendency, Measures of dispersion, Probability theory, Independent and dependent events, Conditional probability, Bayes theorem, Random variable, Probability density function, Discrete probability distributions, Continuous probability distributions, Central limit theorem , Test of hypothesis.

References

1- Foundations of the Theory of Probability, A N Kolmogorov, 2018

Probability and Mathematical Statistics: Theory, Applications, and Practice, Mary C. Meyer, ISBN-13: 978-1611975772.

BAS111 Engineering Mechanics (1,3,0)

Statics: internal forces, friction, center of mass, virtual work. Dynamics: moment of inertia, work and energy, impulse and impact, introduction to mechanical vibrations.

References

1- Engineering Mechanics (Dynamics), by R.C. Hibbeler, 6th edition, Macmillan Publishing company.
2- Vector mechanics for Engineers (Dynamics), by Beer and Johnson.
3- Elements of statics and dynamics, by S.L. Long.

MEC112 Manufacturing Technology (1) (2,1,1)

The topics includeconventional machining operationssuch as turning, drilling, milling, shaping and gear cutting, grinding ...etc. Calculation of machining and production times, dimensional measurements and tools, operations sequences and operation cards. Introduction to production management and planning, Introduction to cost analysis. Practical applications in workshops.

References

1- Manufacturing Technology, Part I, C. Elanchezhian, B. VijayaRamnath, 2nd edition, 2006.
2- Manufacturing Technology, Part II, C. Elanchezhian, B. VijayaRamnath, 2nd edition, 2007.
3- Introduction to Basic Manufacturing Processes and Workshop Technology, Rajender Singh, New age Int. Publisher, 2006.

MEC120 Thermodynamics (2,2,1)

Basic concepts of thermodynamics, energy concepts, pure materials and the use of steam tables, ideal gas model, first law of thermodynamics and its applications, energy equation for closed systems and their applications on different thermal processes, energy equation for open systems, procedures for instability and stability of open systems, reversible procedures and non-reversible procedures , the second law of thermodynamics, Carnot cycle, thermal machines and its efficiencies, entropy and change in entropy, the definition of entropy efficiencies , possible Energy, reversible work, and availability analysis.

References

1- Yunus, A. C, Thermodynamics, An Engineering Approach, McGraw-Hill, 8th edition, 2010.
2- Van Wylen, G. Sonntag R. and Borgnakke, C. Fundamentals of Classical Thermodynamics, John Wiley & Sons, Inc. 6thedition, 2001.

BAS112 Differential Equations (2,2,0)

Functions of several variables, Partial differentiation, Maximum and minimum values, Conditional extrema, Curvature, Double and triple integrals, Line integral, Ordinary differential equations, first order and higher order, Linear Systems of ordinary differential equations, Vectors analysis, Gradient, Laplace transformations, Inverse Laplace transformations.

References

1- Elementary Differential Equations and Boundary Value Problems, William E. Boyce, Richard C. DiPrima, Douglas B. Meade, ISBN-13: 978-1119443766.
2- Schaum's Outline of Differential Equations, 4th Edition (Schaum's Outlines) 4th Edition, by Richard Bronson, GabrielCosta, ISBN-13: 978-0071824859.

MEC121 Fluid Mechanics (1) (2,1,2)

Introduction and basic concepts and fluid properties, fluid statics and hydrostatic pressure forces and their applications, fluid flow characterization, fluid motion principles and fluid kinematic , concept of controlled volume and integral equation for Reynolds theory, law of mass conservationand its applications, law of momentum conservation and its applications, energy conservation law ,Bernoulli equation and its applications, Basics of dimensional analysis and dynamic symmetry, laminar and turbulent flow in pipes, friction coefficient and major and minor losses, flow in pipes and tubes and piping system.

References

1- Fundamentals of Fluid Mechanics By B.R. Munson, D.F. Young, T.H. Okiishi, W.W. Huebsch 6thEditon, Wiley, NY (2010)
2- Fluid Mechanics: Fundamentals and Applications By Y. Cengel, McGraw-Hill, NY (2006).
3- Fluid Mechanics By F. M. White, McGraw-Hill, NY (2003).
4- Introduction to Fluid Mechanics By R.W. Fox, A.T. McDonald, and P.J. Pritchard, Wiley, NY (2004).
5- Elementary Fluid Mechanics By R. L. Street, G.Z. Watters, and J.K. Vennard, Wiley, NY (1996).
6- Engineering Fluid Mechanics by Donald F. Elger, Barbara C. Williams, Clayton T. Crowe, John Wiley & Sons; 9thedition, 2009.

MEC113 Mechanics & Testing of Materials (2,1,1)

Study of the mechanical behavior of solid bodies (bars, axes, beams, etc.) under the effect of different loads, thermal stresses, the relationship between uniform strain and stress, axial deformation (uniaxial), shear forces and bending moments in beams, stress in beams, torsion in shafts and pipes with thin walls, combined loads, pressure vessels with thin walls, analysis and transformation of plain stresses and strains. Mechanical tests of the materials (hardness - impact - tension - compression - bending - shear - torsion - wear - creep), non-destructive tests of metals (X-ray diffraction - ultrasonic waves - magnetic methods ... etc.), practical experiments in the laboratory to perform the mechanical tests.

References

1- Testing of Engineering Materials by: Carl William Muhlenbruch
2- Hibbeler, R. C. Mechanics of Materials. 6thed. East Rutherford, NJ: Pearson Prentice Hall, 2004. ISBN: 9780131913455.
3- Crandall, S. H., N. C. Dahl, and T. J. Lardner. An Introduction to the Mechanics of Solids. 2nd ed. New York, NY: McGraw Hill, 1979. ISBN: 9780070662308.
4- Vernon John. Testing of Materials, Macmillan, 1992. ISBN: 0333447832, 9780333447833

MEC102 Engineering Mathematics Using Computer (1,0,3)

Introduction to MATLAB and the basics of computer programming using MATLAB. MATLAB environment, MATLAB variables, vectors, matrices, matrix algebra, 2D and 3D plots, conditional loops, scripts, functions, file Input-Output, structures, cells. Using MATLAB for solving linear and nonlinear equations, differential equations and numerical integration. Applications in fluid mechanics, mechanics, statistics …etc.

References

1- Computer Programming with MATLAB, J. Michael Fitzpatrick, ÁkosLédeczi, 2015
2- An Engineer's Introduction to Programming with MATLAB 2018, Shawna Lockhart, Eric Tilleson.

SECOND YEAR

MEC210 Engineering Economy & Accounting (2,2,0)

The basic concepts of engineering economy, Time-money relationships, cash flow, and effects of inflation, Present worth (PW) method, annual worth (AW) method, rate of return (ROR) method, benefit/cost ratio (B/C) method, and incremental rate of return analysis, Depreciation schedules, replacement analysis, and after-tax analysis, cost estimation and indirect cost allocation,break-even analysis and payback period, selection among competing alternatives, Sensitivity analysis and expected value decisions.

References

1- Sullivan; wicks and koelling "Engineering Economy" 6th ed. 2015 by Pearson h. Ed Inc
2- Blank and Tarquin "Engineering Economy" 8th ed. 2018 by McGraw hill.

MEC201 Theory of Measurements & Sensors (1,1,3)

Basic concepts of measurements and analysis of experimental results; introduction and fundamentals of measurement and calibration devices; measurement errors, measurements Linearity; different statistical methods; static and dynamic characteristics of sensors; adaptation of measurement signals; measurement of the displacement, velocity, acceleration, temperature, pressure, strain, flow, force; signal adaptation; actuators (mechanical, hydraulic, pneumatic, electrical); Dimensions Tolerances and allowances; basics, design and application of limit measurement parameters.

References

1- Measurement & Instrumentation Principles,3rd Edition by Morris
2- Measurement and Instrumentation. Theory and Application, Alan S. Morris, Reza Langari 2012
3- Maintenance of Instruments and Systems [2 ed.], Lawrence D. Gottschee, Lawrence D. Gottschee 2004

BAS211 Numerical & Complex Analysis (2,2,0)

Numerical differentiation and integration, Solving system of linear equations, Solving system of nonlinear equations, Numerical methods for solving ordinary differential equations, Partial differential equations, Wave and heat equations, Fourier series and Fourier integrals, Functions of complex variable, Differentiation of complex functions, Series of complex variable, Integration of complex functions, Integration by residue theorem.

References

1- Numerical Methods for Scientists and Engineers, R. W. Hamming, ISBN-13: 978-0486652412.
2- A First Course in Numerical Analysis: Second Edition, Anthony Ralston, Philip Rabinowitz, ISBN-13: 978-0486414546.
3- Complex Analysis, 3rd ed. 2010 Edition, Joseph Bak, Donald J. Newman, ISBN-13: 978-1441972873.

MEC211 Kinematics & Dynamics of Rigid Bodies (2,2,1)

Kinematics machines: Types of mechanisms, degree of freedom of mechanisms, Kinematics movement of the rigid objects, introduction to planner mechanisms, kinematics analysis of the planer mechanisms: (Displacement, velocity, acceleration), the characterization of the different types of gears (simple, composite, planetary) design and analysis of the form of camshafts and attachments, Kinematics of belts and chains. Machines dynamics: planar motion dynamics of the rigid bodies, analysis of the static and dynamic forces at mechanisms, the dynamics of reciprocating machines, sketches of rotation torque diagrams, dynamic equilibrium, gyroscope, design of the appropriate flywheels for different engines and various mechanisms.

References

1- R.C. Hibbeler, "Engineering Mechanics: Dynamics," 9th edition, Prentice Hall, 2001.
2- F.P. Beer and E.R. Johnston, "Mechanics for Engineers: Statics," 4th edition, McGraw-Hill book company, 1984.
3- Bedford and W. Fowler, "Engineering Mechanics: Statics & Dynamics Principles," Prentice Hall, 2003.

MEC212 Manufacturing Technology (2) (2,1,2)

Introduction to foundry technology, pattern making and design, technology of moulding and core making, testing of moulding sand, different types of moulding sand and their properties, gating system design and risering, melting technology, casting defects and its remedy, casting methods- Fettling and heat treatment of casting- Welding technology: Basic aspects of welding, solid state welding methods, fusion welding methods, welding defects and remedy, destructive and non-destructive tests.

References

1- Principles of Foundry Technology, 4th edition, P. L. Jain.
2- A Textbook of Manufacturing Technology, Er. R.K. Rajput.
3- Workshop Technology, S.K., Garg.
4- Manufacturing Process, B.H. Amstead, Phillip Ostwald, Myron L. Begemaw.
5- Workshop Technology, Vol. II, Dr. R.K. Singal
6- Manufacturing Engineering and Technology, Schmid, S. , and Kalpakjian , S., Pearsan Education, Inc., 6th Edition, 2006
7- اساسيات هندسة صب (سباكة) المعادن د. احمد سالم الصباغ – هندسة عين شمس.
8- تكنولوجيا الانتاج والتصنيع د. محمد صلاح الدين عباس حامد – د. ابراهيم موسى ابراهيم.

MEC213 Mechanical Design (1) (2,4,0)

Concepts of mechanical design, primary steps of the mechanical design, engineering materials, engineering manufacturing considerations of the mechanical design, design of mechanical parts under the effect of static and repeated loads, stress concentration, safety factor, bolts design, design of temporary and permanent joints (by thread bolts, welding, rivets), design of power screws, design of springs, design of pipe joints, design of hydraulic cylinders, design of pressure vessels.Design projects using 3D modeling programs such as (SolidWorks or Autodesk Inventor).

References

1- Richard G. Budynas, and J. Keith Nisbett, Shigley's Mechanical Engineering Design 9th Edition, McGraw Hill, ISBN 978-0-07-352928-8 (alk. paper)
2- Black and Adams and Machine Design.
3- GalalShawki and Design Data Tables
4- R.S. Khurmi, J.K. Gupta, A Textbook of Machine Design, Eurasia Publishing House (PVT.) LTD., 2005.

MEC220 Heat Transfer (2,1,2)

Introduction to heat transfer methods, one dimensional conduction, conduction with internal source of heat, continuous conduction in two directions, unstable conduction in one direction, Convection heat transfer, natural and forced convection, extended surfaces, Fins.

References

1- Frank P. Incropera, David P. Dewitt. "Introduction to Heat Transfer" 6th Edition.
2- Kreith, F. and Black, W. Z., Basic Heat Transfer, Harper and Row Publishers, New York (2000).
3- Kreith, F., Principles of Heat Transfer, Crowell, New York (2005).

MEC214 Mechanical Vibrations (2,2,0)

Properties of vibrational motion, derivation of the governing differential equations, free and damping vibration, forced harmonic motion, the imbalanced rotation and reciprocation, the motion of carriages, vibration isolation, transmitted vibration, free vibrations of systems with two-degrees of freedom, instant analysis, vibration of system with many degrees of freedom, continuous systems, numerical and computational methods to determine the natural frequencies.

References

1- Engineering Vibration Analysis with Application to Control Systems, Edward Arnold, 1995
2- Mechanical Vibration, by William J. Palm III, ISBN-13: 978-0471345558
3- Singiresu S. Rao, Mechanical Vibrations 5th Edition, ISBN-13: 978-0132128193.

ELE270 Electrical Machines (2,1,1)

Three-phase systems, the basics, power, transmission, DC machines, the electric generator, electric motors, AC machines, generator, induction motor, Synchronous motor, special motors, electric transformer, equivalent circuits, design characteristics, substation, circuit breakers, insulators, main conductors, protection.

References

1- A Text Book of Electrical Technology Vol. II AC & DC Machines, Theraja B. L., Published by S Chand and Company Limited, 2007
2- Electrical Transformers and Rotating Machines 4th Edition, Stephen L. Herman, ISBN-13: 978-1305494817
3- Transformer Principles and Applications, Otto Taylor, Jim Overmyer , Ron Michaelis, ISBN-13: 978-0826916044

MEC221 Fluid Mechanics (2) (2,1,1)

Navier-Stokes equations for fluid flow, Approximate and analytical solutions for differential equations, ideal flow, laminar flow, laminar flow on horizontal and inclined planes, boundary layers, an introduction to turbulent flow and physical nature,mathematical modeling examples, unstable flow in pipes and water hammer.

References

1- Fundamentals of Fluid Mechanics, B.R. Munson, D.F. Young, T.H. Okiishi, W.W. Huebsch 6^{th}Edition, Wiley, NY (2010)
2- Fluid Mechanics: Fundamentals and Applications, Y.Cengel, McGraw-Hill, NY (2006).
3- Fluid Mechanics, F. M. White, McGraw-Hill, NY (2003).
4- Introduction to Fluid Mechanics, R.W. Fox, A.T. McDonald, and P.J. Pritchard, Wiley, NY (2004).
5- Elementary Fluid Mechanics, R. L. Street, G.Z. Watters, and J.K. Vennard, Wiley, NY (1996).
6- Engineering Fluid Mechanics, Donald F. Elger, Barbara C. Williams, Clayton T. Crowe, John Wiley & Sons; 9^{th}edition, 2009.

THIRD YEAR

MEC320 Hydraulic & Pneumatic Systems (2,0,3)

Introduction to Fluid Systems, Main parts of pneumatic circuits and hydraulic circuits (joints and fittings), Compressors, Pumps, pneumatic and hydraulic motors, maintenance and safety in fluid systems, electrostatic control in hydraulic and pneumatic circuits.

References

1- Introduction To Hydraulics and Pneumatics, 3rd Ed, IlangoSivaraman, PHI Learning Pvt. Ltd., 2017.
2- Fluid Power Dynamics, By R. Keith Mobley, Newnes Publisher, 2000.
3- Hydraulics and Pneumatics: A Technician's and Engineer's Guide, Andrew Parr, Elsevier, 2011.

MEC330 System Dynamics (2,2,0)

Natural systems (mechanical, electric, hydraulic, thermal…), modeling using signal diagram, simulation definition (simulation for natural parts and simulation with programs), principles of simulation of natural systems (mechanical, electrical, hydraulic, thermal, medical), simulation techniques via computer, applications using modern software packages such as MATLAB or LabVIEW.

References

1- System Dynamics: Modeling, Analysis, Simulation, Design, Ernest Doebelin, ISBN-13: 978-0824701260
2- System Dynamics: Modelling and Simulation, BilashKanti Bala, Fatimah Mohamed Arshad, KusairiMohd Noh, Springer, 2017.

ELE380 Logic Circuits (1,1,2)

Accounting systems, Logic gates, Booleans Algebra, Sum of products, Product of sum, Karnough Maps up to four signals, Combinational circuits, Sequential circuits and state diagram, Flip flop, Multiplexers and De-multiplexers, Encoder and Decoders, adders and subtractors, Timers, Registers and Programmable logic devices.

References

1- Frank D. Petruzella, "Programmable Logic Controllers', McGraw-Kill Companies, 4th edition, 2018
2- W. Bolton, "Programmable Logic Controller, Elsevier Ltd, 5th Edition.2017.
3- E.A. Parr, MSc, CEng, MIEE, MInstMC, "Programmable Controllers An engineer's guide", Newnes, an imprint of Elsevier, Latest editions, 2019.

ELE383 Signal Analysis & Digital Signals (2,2,1)

Signal classifications and features, Fourier transform and FFT, convolutions and impulse response, correlations functions and density functions, Discrete Fourier Transform, Digital filters and Z-transforms.

References

1- Analog and Digital Signal Analysis: From Basics to Applications, Cohen Tenoudji Frédéric, Springer, 2016, ISBN-13: 978-3319423807.
2- Digital Signal Processing, J.S. Chitode, Technical Publications, 2008.

MEC332 Design &Analysis of Mechatronics Systems (2,1,2)

A general introduction to mechatronics systems, Different and modern methods of control Selection of sensors, Actuators selections, Interfacing (programmable logic controllers - microprocessors) - compatibility and electronic connectivity systems - design and implementation of a small project including the characteristics of artificial intelligence (and it includes sensors - correctors - control unit - and Signal conditioner).

References

1- Mechatronic Systems: Analysis, Design, and Implementation, Boukas, El-Kébir, Al-Sunni, Fouad M., 2012.
2- Mechatronic Systems Design: Methods, Models, Concepts, Authors: Janschek, and Klaus, 2012.
3- Mechatronics System Design 2nd Edition, by Devdas Shetty, Richard A. Kolk, ISBN-13: 978-1439061985.

ELE381 Electronics Eng. for Mechatronics (2,1,2)

Introduction to semiconductor materials and devices. DC, AC analysis of transistor circuits (BJT, MOSFET). Amplifier circuits, bandwidth considerations; feedback and stability. Operational amplifiers and applications in filter and oscillator circuit design. relay amplifier delivery, frequency response amplifiers, power amplifiers, differential amplifiers, amplifiers, and process filters.Voltage regulator and timer circuits. Switching properties of transistors.

References

1- Grob's Basic Electronics, tenth edition, Schultz, May 3, 2006
2- Electronic devices and circuit theory, tenth edition, Robert Boylestad, 2005
3- Basic Electronics Solid State, tenth edition, Theraja, Published 2010 by S. Chand & Company Ltd.

MEC300 Field Training (1) (0,0,0)

Duration of the training: four weeks equivalent to 160 training hours (8 Hours per day × 5 Business Day × 4 Weeks). The student is required to spend a month in an industrial facility for training that is relevant to his/her field of study. The department council will assign the faculty members to set the training plan with the industrial partners and to follow up on the student's progress. The students will be divided into groups, each consists maximum of 5 students. At the end of the training period, the student is required to submit a report and give a presentation before an examination panel from the department and/or industrial partners. In the report and presentation, the student would highlight the achievements and/or challenges she/he has gone through during the training period. 25 marks of the student's score is provided by the industrial training supervisor and the remaining 25 marks is determined based on: the student's report, final presentation, and how well the student responds to the examination board questions.

References

According to the field of training

MEC333 Advanced Measurements in Mechatronics (1,1,2)

Measurements and general systems of advanced mechatronics measurements, Measurements of power and energy, different sensors bridges, Instrumentation amplifiers Electronics biological sensors (EMG, ECG…etc.), Chemical sensors, Spectrometers, catalytic sensors, Fiber optics transducers, Color change sensors, Multi sensors arrays, Fusion sensors.

References

1- Richard S. Figliola and Clemson University, "Theory and Design for Mechanical Measurements", 5th edition, John Wiley & Sons, Inc., 2011.
2- Alan S. Morris, "Measurement and Instrumentation Principles", 3rd edition, Alan S. Morris, 2001

MEC331 Automatic Control (2,2,0)

Transient response for 1st and 2nd degree control system, root locus method, stability analysis (Nyquist, phase angle margin, gain margin), control system compensation (Bode diagram, polar plots, log magnitude versus phase plots, lead-lag-lead/lag compensation, polar and Bode plots for compensator, an introduction for pole placement based on feedback, design of observer and compensator based on the dynamic feedback, data analytics, design of industrial controller of type (proportional P, Integrator I and differentiator D then PI and PID, introduction to state space, introduction to controllability and observability.

References

1- Automatic Control Systems 7th Edition, Kuo, Benjamin C., JhonWiely& Sons, 2003.
2- Modern Control Engineering, K. Ogata, Printice Hill, 2010.
3- Automatic control System, F.Golnaraghi, Johon Wiley, 2010.

MEC329 Embedded Systems Programming and Computer Interfacing (2,2,2)

Modern and latest embedded Microcontrollers architectures, Microcontrollers programming instructions, addressing data manipulation instructions, Control instructions, timers, counters, Pulse width modulations, VHDL programming for FPGA embedded systems, Analogue and digital interfacing.Basics of computer interfacing, Data manipulation and process monitoring systems, Concepts of real time computer control systems, Computer Hardware requirements for real time systems, computer software requirements for real time control, stability of real time systems, real time control and interfacing project

References

1- Programming Embedded Systems, 2nd Edition, Michael Barr and Anthony Massa, 2006, Publisher(s): O'Reilly Media, Inc., ISBN: 9780596009830.

2- Introduction to Embedded Systems - A Cyber-Physical Systems Approach, 2nd Edition, Edward Ashford Lee, and SanjitArunkumarSeshia, Publisher: The MIT Press, 2016.
3- Title Embedded System Design: A Unified Hardware/Software Introduction, Frank Vahid and Tony Givargis, Publisher: Wiley; New edition, 2001.
4- User Interface Management Systems: Models and Algorithms (The Morgan Kaufmann Series in Computer Graphics and Geometric Modeling), 1991, Jr. Olsen, Dan R.
5- Brain-Computer Interfacing: An Introduction, Rajesh P. N. Rao, Cambridge University Press, Sep 30, 2013
6- Digital Video and HD: Algorithms and Interfaces (The Morgan Kaufmann Series in Computer Graphics) 2nd Edition, by Charles Poynton, ISBN-13: 978-0123919267

ELE383 Signal Analysis & Digital Signals (2,2,1)

Signal classifications and features, Fourier transform and FFT, convolutions and impulse response, correlations functions and density functions, Discrete Fourier Transform, Digital filters and Z-transforms.

References

1- Analog and Digital Signal Analysis: From Basics to Applications, Cohen Tenoudji Frédéric, Springer, 2016, ISBN-13: 978-3319423807.
2- Digital Signal Processing, J.S. Chitode, Technical Publications, 2008.

ELE382 Power Electronics & Driving Systems (2,0,2)

Thyristors, theory of operation, firing methods, drawbacks of thyristors and methods of overcome, turning on and turning of methods, three-phase and single-phase AC voltage controller (AC/AC converter) feeding resistive and inductive loads, three-phase and single-phase rectifier circuits (AC/DC converter) feeding resistive loads and highly inductive loads, Chopper circuits (DC/DC converters) feeding resistive, inductive, and highly inductive loads, three-phase and single-phase inverters for different loads, single-phase to single-phase converters, PWM inverters, solid-state switches, power sources, DC motor drives, AC motor drives, control of firing circuits, thyristors in electric power circuits, temperature control of solid materials and air-conditioning, application of photo thyristors, testing and protection of the firing and control circuits.

References

1- Power Electronics and Motor Drive Systems 1st Edition, by Stefanos Manias, ISBN-13: 978-0128117989.
2- Power Electronics: Converters, Applications, and Design 3rd Edition, Ned Mohan, Tore M. Undeland, William P. Robbins, ISBN-13: 978-0471226932.
3- Fundamentals of Power Electronics 3rd ed. 2020 Edition, Robert W. Erickson, Dragan Maksimović, ISBN-13: 978-3030438791

MEC333 Advanced Measurements in Mechatronics (1,1,2)

Measurements and general systems of advanced mechatronics measurements, Measurements of power and energy, different sensors bridges, Instrumentation amplifiers Electronics biological sensors (EMG, ECG…etc.), Chemical sensors, Spectrometers, catalytic sensors, Fiber optics transducers, Color change sensors, Multi sensors arrays, Fusion sensors.

References

1- Richard S. Figliola and Clemson University, “Theory and Design for Mechanical Measurements”, 5th edition, John Wiley & Sons, Inc., 2011.
2- Alan S. Morris, “Measurement and Instrumentation Principles”, 3rd edition, Alan S. Morris, 2001

ELE382 Power Electronics & Driving Systems (2,0,3)

Thyristors, theory of operation, firing methods, drawbacks of thyristors and methods of overcome, turning on and turning of methods, three-phase and single-phase AC voltage controller (AC/AC converter) feeding resistive and inductive loads, three-phase and single-phase rectifier circuits (AC/DC converter) feeding resistive loads and highly inductive loads, Chopper circuits (DC/DC converters) feeding resistive, inductive, and highly inductive loads, three-phase and single-phase inverters for different loads, single-phase to single-phase converters, PWM inverters, solid-state switches, power sources, DC motor drives, AC motor drives, control of firing circuits, thyristors in electric power circuits, temperature control of solid materials and air-conditioning, application of photo thyristors, testing and protection of the firing and control circuits.

References

1- Power Electronics and Motor Drive Systems 1st Edition, by Stefanos Manias, ISBN-13: 978-0128117989.
2- Power Electronics: Converters, Applications, and Design 3rd Edition, Ned Mohan, Tore M. Undeland, William P. Robbins, ISBN-13: 978-0471226932.
3- Fundamentals of Power Electronics 3rd ed. 2020 Edition, Robert W. Erickson, Dragan Maksimović, ISBN-13: 978-3030438791

FOURTH YEAR

MEC430 Computer Aided Design & Manufacturing (CAD/CAM) (1,0,4)

Introduction to CAD/CAM, Principles of NC and CNC machines (types and operations), CNC programming, industrial robots, components of CAD systems, computer graphics, modelling techniques, introduction of finite element analysis. Design projects using computer software e.g. SolidWorks, Simulation Xpress and Ansys …etc. Laboratory exercises in CNC Lab.

References

1- Computer-Aided Design, Engineering, and Manufacturing: Systems Techniques and Applications, Volume III, Operational Methods in Computer-Aided Design Cornelius T. Leondes, 2000
2- Advanced Computer-Aided Fixture Design Yiming (Kevin) RongSamuel Huang, 2005
3- Computer Aided Design Of Gating System For A Die-Casting Die Dr. Chandan Deep Singh, Dr. Jatinder MadanAmrik Singh, 2018

MEC431 Robot Control (1,0,4)

Robot classifications and specifications, robot data sheets, sensors and actuators selections for robotics systems, robot transformations, DH parameters and direct kinematic models, Inverse kinematic model, Jacobean and inverse differential models' dynamic model of robots, trajectory planning, Introduction to robot visions and mobile robots.

References

1- John J. Craig, "Introduction to Robotics Mechanics and Control", PEARSON Prentice Hail, 3rd edition, 2017
2- Saeed B. Niku, "Introduction to robotics, Analysis, control, Application", John Wiley, 2nd edition, 2017.
3- Mark W. Spong, Seth Hutchinson and M. vidyasagar, "Robot Modeling and Control, John Wiley,Latest edition, 2020

MEC432 Programable Logic Controllers and Supervisory Control (2,2,1)

Programmable Logic Control (PLC) architecture, Input modules and PLC sensors, Output modules and PLC actuators, scan cycles, PLC installation, different PLC programming (Ladder diagram, statement list and function block diagram), latches and logic ladder programming, timers, counters, jump instruction, move, data manipulations, sequencer, shift registers and introduction to direct control systems and supervisory control.

References

1- Programmable Logic Controllers: Edition 5, William Bolton, Sep 2009
2- Programmable Logic Controllers: Industrial Control, Khaled KamelEman Kamel, Jul 2013
3- Manufacturing Systems Control Design: A Matrix-based Approach, Stjepan BogdanFrank L. LewisZdenkoKovacicJose Mireles, Aug 2006

MEC433 Industrial Processes Control (2,1,1)

Different industrial process and process control concepts, Design of proportional, derivative and integral controllers, effect of pure time delay and time lead on processes performance, different methods of controllers tuning parameters, optimization of controllers parameters, Design of practical control systems based on frequency response, application of latest computer packages in the field of automation and process control.

References

1- Advanced Control of Industrial Processes: Structures and Algorithms Piotr Tatjewski, Feb 2007
2- Supervision and Control for Industrial Processes: Using Grey Box Models, Predictive Control and Fault Detection Methods Bjorn Sohlberg, Dec 2012
3- Simulation of Industrial Processes for Control Engineers Philip J Thomas, Jul 1999
4- Designing Controls for the Process Industries Wayne Seames, Sep 2017
5- Fundamentals of Industrial Instrumentation and Process Control, Second Edition: Edition 2 William C. Dunn, Sep 2018

MEC400 Field Training (2) (0,0,0)

1- Duration of the training: four weeks equivalent to 160 training hours (8 Hours per day × 5 Business Day × 4 Weeks). The student is required to spend a month in an industrial facility for training that is relevant to his/her field of study. The department council will assign the faculty members to set the training plan with the industrial partners and to follow up on the student's progress. The students will be divided into groups, each consists maximum of 5 students. At the end of the training period, the student is required to submit a report and give a presentation before an examination panel from the department and/or industrial partners. In the report and presentation, the student would highlight the achievements and/or challenges she/he has gone through during the training period. 25 marks of the student's score is provided by the industrial training supervisor and the remaining 25 marks is determined based on: the student's report, final presentation, and how well the student responds to the examination board questions.
2- **References**

According to the field of training

MEC414 Feasibility Study of Engineering Projects (1,2,0)

Basic concepts in feasibility study, market feasibility study, technical and engineering study,financial feasibility study, commercial feasibility study for small projects.

References

1- Feasibility Study Preparation and Analysis by Charles Zawde, 2017.

MEC490 Graduation Project (0,0,10)

This course requires the students, working in teams, to take an actual engineering project from the initial proposal stage through the preliminary design phase to the completion of a conceptual design of the project. Students will conduct the necessary activities and prepare the various documents needed to complete the design. The project should include a theoretical analysis as well as implementation of some parts of the project experimentally or simulation by computer.

References

According to the field of the project

ELECTIVE COURSES

List (1) of Elective Courses

ELE470 Advanced Electrical Circuits (1,2,1)

Frequency domain phasor representation of AC circuits using complex variables, AC circuit analysis methods (nodal, mesh and circuit theorems: source transformation, superposition, Thevenin and Norton), AC power, effective value, maximum power transfer theorem, transformer circuit analysis, series, parallel and coupled resonance circuits, operational amplifier as a circuit concept: properties and applications, Three phase voltage sources, analysis of the balanced Y-Y circuit, analysis of the Y-Δ, Δ-Y, and Δ-Δ circuits, complex power calculation in three phase, unbalanced and four wire three phase loads, unbalanced Y loads with neutral.

References

1- Compact Models for Integrated Circuit Design: Conventional Transistors and Beyond Samar K. Saha, 2018
2- Advanced Electrical and Electronics Engineering: Volume 2, Jian Lee, 2011
3- Advanced Electric Circuits: The Commonwealth and International Library: Applied Electricity and Electronics Division, A. M. P. Brookes, 2013

ELE471 Advanced Electrical Drive Systems (1,2,1)

General motors and their designs, two-phase induction motors, single-phase induction motors and their design, design of single-phase small transformers, linear induction motors, stepping motors and their design. Elements of electric drive systems - Mechanical properties of electric drive systems - Motor reducers in electric drive systems - Balance of engine systems and loads.

References

1- Advanced Electrical Drives: Analysis, Modeling, Control, Rik De DonckerDuco W.J. PulleAndréVeltman 2010
2- Advanced Electric Drive Vehicles, Ali Emadi 2014
3- Fundamentals of Electrical Drives: Edition 2, Andre VeltmanDuco W.J. PulleR.W. de Doncker 2016

ELE480 Advanced Electronic Circuits (1,2,1)

AC model amplifier, AC response of amplifier, operation amplifier (op-amp): design and applications in linear and nonlinear circuits, summation circuits, subtraction circuits, differentiator and integrators circuits, analog oscillators, active filters, logarithmic and exponential op-amp, controlled sources, constant gain multiplier circuits, waveforms modification, sinusoidal oscillators, square wave oscillators.

References

1- Grob's Basic Electronics, tenth edition, Schultz.
2- Electronic devices and circuit theory, Robert Boylestad.

3- Basic Electronics Solid State, Theraja.

List (2) of Elective Courses

MEC460 Computer Applications in Mechatronics (1,2,1)

Data manipulation and introduction to computer organization, programming and simulation of mechatronics application using latest computer packages (MATLAB and graphical user interface, LabView), applications of Field programming and gate array systems.

References

1- Mechatronics and Robotics: New Trends and Challenges, Marina IndriRoberto Oboe, 2020
2- Mechatronics and Machine Vision in Practice 3 , John BillingsleyPeter Brett, 2018 Design, Manufacturing And Mechatronics - Proceedings Of The 2015 International Conference (Icdmm2015) , A Mehran Shahhosseini , 2015
3- Robotic Systems: Concepts, Methodologies, Tools, and Applications: Concepts, Methodologies, Tools, and Applications Management Association, Information Resources Jan 2020
4- Mechatronics 2017 - Ideas for Industrial Applications Jerzy ŚwiderSławomirKciukMaciej Trojnacki Mar 2019

MEC461 Artificial Intelligence Control (1,2,1)

Artificial neural network (ANN) concepts, different types of Artificial neural network, multi-layer neural networks, Back propagation algorithm, application of ANN, concepts of fuzzy logic, fuzzification and de-fuzzification, fuzzy logic applications and control, introduction to neuro fuzzy logic.

References

1- Beginning Artificial Intelligence with the Raspberry Pi Donald J. Norris, Jun 2017
2- Principles of Artificial Intelligence Nils J. Nilsson, Jun 2014

Artificial Intelligence in Industrial Decision Making, Control and Automation S.G. TzafestasH. B. Verbruggen

List (3) of Elective Courses

MEC462 Optimal Control (2,0,1)

Review of single input single output controllers, state space design, controllability and observability, pole placements and linear quadratic regulators, Lagrange multiplier, Hamiltonian function and some optimization techniques.

References

1- Optimal Control, Richard Vinter, Jun 2010
2- Optimal Control: Weakly Coupled Systems and Applications , Zoran GajicMyo-Taeg LimDobrila SkataricWu-Chung SuVojislavKecman, Oct 2018

3- Optimal Control: Theory, Algorithms, and Applications, William W. Hager Panos M. Pardalos, Apr 2013
4- Optimal Control, Leonid T. Aschepkov Dmitriy V. Dolgy Taekyun KimRavi P. Agarwal, Jan 2017

MEC463 Discrete Control (2,0,1)

Generalized block diagram of Discrete system, Z transform and inverse of Z transform, Zero order hold and manipulation of discrete block diagram, stability analysis and jury test of discrete systems, different method of stability analysis of discrete systems, design of discrete controllers.

References

1- Discrete Control Systems,Yoshifumi Okuyama, 2013
2- Advanced Discrete-Time Control: Designs and Applications , Khalid AbidiJian-Xin Xu, 2015

MEC464 Nonlinear Control (2,0,1)

Introduction to nonlinear control, phase plan portrait, describing functions, analysis and design of nonlinear control systems, Lyapanove stability criterion, direct method of Lyapanove, sliding and adaptive control concepts.

References

1- Nonlinear Control Systems and Power System Dynamics, Qiang Lu Yuanzhang Sun Shengwei Mei, Apr 2013
2- Nonlinear Control of Dynamic Networks , Tengfei Liu Zhong-Ping Jiang David J. Hill, Sep 2018
3- Nonlinear Control Systems using MATLAB, Mourad Boufadene, Sep 2018
4- Nonlinear Control Systems II, Alberto Isidori, Dec 2012
5- Nonlinear Control Systems: An Introduction, Edition 2, Alberto Isidori, Apr 2013.

List (4) of Elective Courses

MEC465 Application of Mechatronics in Automotive (2,0,1)

Introduction of automotive engineering, principle of injection systems, and spark ignition systems, different sensors in automotive application (throttling sensors, crank sensors), Mechatronics and gear drive systems, Anti sliding braking system (ABS), electric automobile and hybrid automotive systems, modern trends in automotive engineering.

References

1- Automotive Mechatronics: Automotive Networking, Driving Stability Systems, Electronics Konrad Reif, 2014
2- Springer Handbook of Automation Shimon Y. Nof, 2009
3- Automotive Mechatronics: Operational and Practical Issues: Volume II B. T. Fijalkowski , 2011

MEC466 Mechatronics Applications in building Energy Management (2,0,1)

Introduction to air condition heating and ventilation systems, control of split units, sensors in building systems(temperature, flow, pressure, humidity, and proximity sensors, building actuators control of control panel of building systems.

References

1- Building Energy Management Systems: An Application to Heating, Natural Ventilation, Lighting and Occupant Satisfaction, Edition 2 Geoff Levermore 2013
2- Management of Knowledge Imperfection in Building Intelligent Systems, Eugene Roventa Tiberiu Spircu 2008

MEC467 Autonomous control (2,0,1)

Introduction to autonomous control, decision making and Markove chain, Mont Carlo algorithm, Application of autonomous control in mechatronics application and automation.

References

1- Autonomous Control Systems and Vehicles: Intelligent Unmanned Systems, Kenzo Nonami Muljowidodo Kartidjo Kwang-Joon Yoon Agus Budiyono, May 2013
2- Autonomous Cooperation and Control in Logistics: Contributions and Limitations - Theoretical and Practical Perspectives, Michael Hülsmann Bernd Scholz-Reiter Katja Windt, May 2011
3- Sensing and Control for Autonomous Vehicles: Applications to Land, Water and Air Vehicles, Thor I. Fossen, Kristin Y. Pettersen, Henk Nijmeijer, May 2011

MEC468 Micro-electromechanical Systems (2,0,1)

Design and manufacturing of Micro-electromechanical systems (MEMS), material specification of MEMS, different methods of MEMS fabrication, principle of design of MEMS such as Inertia measurement systems, fusion sensors, optical MEMS, Bio MEMS.

References

1- Nano- and Micro-Electromechanical Systems: Fundamentals of Nano- and Microengineering, Second Edition, Edition 2, Sergey Edward Lyshevski, Oct 2018
2- Micro Electro Mechanical System Design, James J. Allen, Jul 2005
3- Dynamics of Microelectromechanical Systems, Nicolae Lobontiu, Jul 2014.
4- Microelectromechanical Systems: Advanced Materials and Fabrication Methods, 1997

MEC469 Advanced Industrial Robotic Systems (2,0,1)

Different trajectory control algorithms of mobile robots, control of Automatic guided Vehicle (AGV), Legged locomotion vehicle and gait analysis of legged robot. Image recognition in robotics, color recognition in robotic systems, analysis of parallel robotic systems.

References

1- Advances in Robot Design and Intelligent Control: Proceedings of the 24th International Conference on Robotics in Alpe-Adria-Danube Region (RAAD), Theodor Borangiu 2015
2- Efficient Dynamic Simulation of Robotic Mechanisms, Kathryn Lilly 2012

3- Robot Navigation from Nature: Simultaneous Localisation, Mapping, and Path Planning Based on Hippocampal Models ,Michael John Milford 2007
4- Advanced Mechanics in Robotic Systems, Nestor Eduardo Nava Rodríguez 2011
5- Nonlinear Control of Vehicles and Robots, Béla LantosLőrinc Márton, 2010.

UNIVERSITY REQUIREMENTS

GEN0X0 Technical Language (2,0,0)

Characteristics of the English or French or German technical language, grammar review, effective sentences and their characteristics, identify some common mistakes in the writing of technical sentence, paragraph construction, types of paragraphs, development of communication skills by reading and analysis of excerpts from technical writing in various engineering disciplines such as mechanical, electrical , civil ... etc.

References:

1- Mark Hancock & Annie McDonald, English Result - Intermediate Level, Oxford University press, Last Edition .
2- Durrell, Martin, " Using German : a guide to contemporary usage / Martin Durrell", Cambridge, U.K. ; New York : Cambridge University Press, 2003.
3- Coffman Crocker, Mary E, " Schaum's outline of French grammar", McGraw-Hil, Schaum's outline series, 1999, 4th ed.

GEN011 Computer Skills (1,0,1)

IT concepts and terminology, Computer hardware, operating systems, Computer networks, Internet, Computer graphics, Multimedia systems, Databases. Practical applications: Operating system (Microsoft Windows), Word processing (Microsoft Word), Spreadsheets (Microsoft Excel), Microsoft PowerPoint, Databases (Microsoft Access). Introduction to programming concepts, programming languages and their classification, logical design of programs and algorithms, structural programming and object-oriented programming.

References:

1- Practice using ICDL components

GEN012 History of Engineering & Technology (2,0,0)

The definition of science, technology, engineering and architecture. The development of civilizations and their relationship to human sciences (ancient Egyptian civilization, Roman and Greek civilization, Mesopotamia, dark ages, industrial revolution). Different engineering disciplines and their role in society. The historical relationship between science and technology. The relationship between the development of engineering, the social and economic development of the environment, the challenges of globalization and the new economy. The contribution of engineers in the new millennium, the issues of economic and industrial development in Egypt.

References:

1- James E. McClellan & Harold Dorn, Science and Technology in World History: An Introduction, The Johns Hopkins University Press, 2nd. Ed., 2006.
2- Richard Shelton Kirby, Engineering in History, Dover publications, 1990.

GEN900 Communication & Presentation Skills (1,1,0)

General introduction to communication, the importance of communication, types of communication, communication barriers, listening skills, attributes and methods of reading, verbal communication: speaking and writing skills, non-verbal communication, dialogue skills and strategies of persuasion, communication in the work environment, writing CVs, reports and official letters.

References:

1- Gary Johns and Alan M. Saks, Organizational Behavior, Addison Wesley Longman, 2009.
2- Scgermerhorn, Jr., R. J., Hunt, G. J., and Osborn, N. R., Organizational Behavior, John Wiley & Sons, Inc., New York, 10th. Ed., 2008.

GEN902 Human Rights and Combating Corruption (1,1,0)

Human rights: general introduction, definition of human rights, characteristics and principles of human rights, general rules of the idea of human rights, historical development of the idea of human rights, types of human rights, individual rights, collective rights (people's rights), sources of human rights, legal system of rules of protection Human rights, human rights according to the Egyptian constitution in 2014, the duties and obligations of individuals in society. Combating corruption: definition of corruption, its causes, effects and characteristics, types of corruption and its causes, the impact of corruption on human rights and development, the impact of corruption on economic rights and sustainable development, criminal confrontation of corruption.

References:

1- Peter Joseph , The New Human Rights Movement: Reinventing the Economy to End Oppression, Inc. Blackstone Audio: Books, 2017

GEN903 Research and Analysis Skills (1,1,0)

Scientific thinking and its characteristics, definition of scientific research and its characteristics, steps of scientific research (selection of the subject of research, determine the problem of research and selection factors, determine the framework of research, determine the method of research, data analysis), types of scientific studies: exploratory studies, descriptive studies, experimental studies . Methods of scientific research: descriptive approach, social survey, content study, content analysis. Data collection tools: Metrics, observation, interview, questionnaire. Data presentation and analysis methods: Descriptive methods, deductive methods.

References:

1- Gary Johns and Alan M. Saks, Organizational Behavior, Addison Wesley Longman, 2009.
2- Scgermerhorn, Jr., R. J., Hunt, G. J., and Osborn, N. R., Organizational Behavior, John Wiley & Sons, Inc., New York, 10th. Ed., 2008.

GEN901 Theory of Sustainability (1,1,0)

The course aims to introduce students to the concept of sustainability and its feasibility in order to develop its capabilities to reach architectural applications that contribute to achieving the goals of sustainability and its usefulness and to clarify the risks of unsustainable environment. The course deals with the components of the natural environment and the factors of preserving its components and equilibrium, the biological system, cycles and ecological chains, the presence characteristics of natural resources, energy and biological systems. Rapid development of sustainability applications and their comprehensiveness based on modern means of communication and digital technologies.

References:

1- Perspectives for a New Social Theory of Sustainability, Mariella Nocenzi and Alessandra Sannella, Springer Nature Switzerland 2020 .

GEN904 Entrepreneurship (1,1,0)

Concepts in Entrepreneurship, Entrepreneurship and Small Enterprises, Generating Ideas for Entrepreneurial Projects, University and Entrepreneurship Opportunities and Challenges, Marketing Plan, Operational Plan, Financial Plan, Business Plan Writing, Technological Environment of Entrepreneurship, External Business Environment of Entrepreneurial Projects, Support Programs for Leading Projects Egyptian Economy, Entrepreneurial Project Presentation Skills.

References:

1- Entrepreneurship: An Evidence-Based Guide by Robert A Baron Edward Elgar Pub., 2012.

GEN905 Professional Ethics (1,1,0)

The course provides the background needed to discuss the core topics of engineering ethics, with a focus on the ethical issues facing engineers in the areas of engineering work in companies. The course includes the definition of the general elements of the ethics of the profession and the observance of the public interest and regulations and regulations, obligations to the community, the responsibilities of engineers, disclosure of violations, behavior, basic principles and codes of the ABET code of conduct of engineers.

References:

1- William Frey, Professinnal Ethics in Engineering, November, 2013, http://cnx.org/content/col10399/1.4/

GEN908 Contracts and Legislation (1,1,0)

The course aims to provide the student with the technical and legislative knowledge related to the practice of the profession. The study of building legislation, urban planning and the laws governing the practice of the profession and the work systems (engineer / owner / contractor / ...) at the local and international levels as well as studying the methods of contracting/rules and systems for the preparation of integrated implementation documents. Tenders and methods of their examination and evaluation.

References:

1- Randall S. Schuler, Susan E. Jackson, Strategic Human Resoure Management , Wiley, 2nd ed., 2007.

2- Lewicki, J. R., Saunders, M. D., and Barry, B., Essentials of Negotiation, McGraw - Hill, 5th. Ed., 2011.

GEN906 Critical Thinking (1,1,0)

Theoretical concepts (memory, thinking, creativity), an introduction to the thinking skills, the nature of thinking (definition, characteristics, levels), types of thinking (creative, critical, scientific), cognitive thinking skills, meta-cognitive thinking skills, thinking measurement tools, strategies Used in the development of thinking skills, programs to teach thinking skills, methods of teaching thinking skills.

References:

3- Critical Thinking: A Beginner's Guide to Critical Thinking, Better Decision Making and Problem Solving Paperback, by Jennifer Wilson,, Create Space Independent Publishing Platform 2017.

GEN907 Human Resources Management (1,1,0)

Historical development of human resources management, key functions of human resources management, human resources planning, access to human resources, training and development of human resources, compensation of human resources, human resource conservation.

References:

1- Human Resource Management, University of Minnesota Libraries Publishing, 2016

GEN909 Method of Scientific Research and Writing (1,1,0)

The course aims to develop the student's abilities to conduct applied scientific research in one of the fields presented for the graduation project and train to work within a research team, while following the steps of sound scientific research to draw conclusions. The elements and components of scientific research: research problem, scientific method to solve problems and fundamental differences between different scientific research methods, methods of collecting data and statistics necessary for research, methods of examination and analysis of data and information and scientific dealing with variables, formulation of research hypotheses, methods of discussion and examination of hypotheses, drawing conclusions. Scientific method of writing a scientific research (thesis writing). The students select one of the problems in the architectural, urban or any technical field, previously presented as the basis for the graduation project, to conduct the necessary scientific research. Finally, the student is discussed orally through a committee to evaluate the student's performance, within his group, and his findings, studies, analyzes, conclusions and recommendations for the graduation project thesis.

References:

1- Research Methodology and Scientific Writing, by C. George Thomas, Ane Books Pvt. Ltd., 2016

STUDY PLANS FOR ELECTRICAL ENGINEERING PROGRAMS

ELECTRICAL ENGINEERING DEPERTMENT
UNDERGRADUATE PROGRAMS

The Electrical Engineering Department contains three academic undergraduate programs as follows-:

1- Electrical power and machines engineering program.
2- Communications and electronics engineering program.
3- Computer systems engineering program.

The first and second year are common for Communications and electronics engineering program and computer systems engineering program. The following diagram shows a general layout of the department: -

1st Year
COMMUNICATIONS AND ELECTRONICS ENGINEERING + COMPUTER SYSTEMS ENGINEERING

1st Year
ELECTRICAL POWER AND MACHINES ENGINEERING

2nd Year
COMMUNICATIONS AND ELECTRONICS ENGINEERING + COMPUTER SYSTEMS ENGINEERING

2nd Year
ELECTRICAL POWER AND MACHINES ENGINEERING

3rd Year
COMMUNICATIONS AND ELECTRONICS ENGINEERING

3rd Year
COMPUTER SYSTEMS ENGINEERING

3rd Year
ELECTRICAL POWER AND MACHINES ENGINEERING

4th Year
COMMUNICATIONS AND ELECTRONICS ENGINEERING

4th Year
COMPUTER SYSTEMS ENGINEERING

4th Year
ELECTRICAL POWER AND MACHINES ENGINEERING

ELECTRICAL POWER & MACHINES ENGINEERING PROGRAM

Program Information

1. Faculty vision:

The faculty of Engineering at Shoubra, Benha University, aspires to be a leading college at the national, regional and international levels in the fields of engineering education, scientific research, innovation and entrepreneurship in order to achieve the sustainable development goals.

2. Faculty Mission

The faculty of Engineering at Shoubra is committed to prepare a graduate with competencies and problem-solving skills[1] that qualify each engineer to compete in local and regional labor markets[2], the graduate will be able to innovate and become an entrepreneur[3], the faculty is also committed to the development of engineering sciences[4] and producing internationally distinguished scientific research[5], within the framework of human values and social responsibility[6].

3. Program Vision

The Electrical Power and Machines Program at the Faculty of Engineering at Shoubra, Benha University, aspires to be a pioneering program in education and scientific research in the fields of electrical power and machines engineering at the regional and international levels and to provide a distinct community service to the community and the surrounding environment.

4. Program Mission

The Electrical Power and Machines Engineering Program at the Faculty of Engineering in Shubra, Benha University, is committed to prepare a graduate equipped with the knowledge and skills[1] that qualify him/her to compete in the labor market locally and regionally[2], as well as to produce distinguished scientific research at the regional and international levels[3], and to provide distinguished community services[4], within the framework of human and ethical values[5].

To judge the compatibility between the program mission and faculty mission, the following matrix is used.

Key Words of Faculty Mission / Key Words of Program Mission	prepare a graduate with competencies and problem-solving skills [1]	compete in local and regional labor markets [2]	innovate and become an entrepreneur [3]	development of engineering sciences [4]	producing internationally distinguished scientific research [5]	human values and social responsibility [6].
Preparing a graduate equipped with knowledge and skills [1]	√		√	√		
compete in the labor market [2]		√	√			
produce scientific research [3]				√	√	
distinguished community participation [4]	√					√

human and moral values [5]						√

5. Program aims

The educational objectives of the power and machines program are to graduate students who have the following attributes:

1. technically competent to solve complex problems in electrical engineering and can adapt effectively in a fast-changing environment.
2. Apply technical knowledge and skills in electrical and electronic circuit analysis, testing and evaluation, as well as operation, protection and management of electrical power systems.
3. Apply science-based theory, concepts and mathematical analysis required to identify, analyze, evaluate and solve technical problems in electric power systems.
4. able to critically think, analyze and make decisions that give due consideration to global issues in business, ethics, society and the environment.
5. able to communicate effectively, act with integrity, and have the inter-personal skills needed to engage in, lead, and nurture diverse teams.
6. committed to lifelong learning, resourceful, resilient and embrace global challenges and opportunities to make a positive impact in society.

To judge the compatibility of program mission with its objectives, the following matrix is used:

Key Words of Program Mission / **Program Objectives**	Preparing a graduate equipped with knowledge and skills	compete in the labor market	produce scientific research	distinguished community participation	human and moral values
Objective #1	√	√			
Objective #2	√		√		
Objective #3	√		√		
Objective #4		√	√	√	√
Objective #5				√	√
Objective #6	√		√		

6. Graduate Attributes

The above objectives are achieved by a curriculum designed to graduate students who are able to:

1. Master a wide spectrum of engineering knowledge and specialized skills and can apply acquired knowledge using theories and abstract thinking in real life situations;
2. Apply analytic critical and systemic thinking to identify, diagnose and solve engineering problems with a wide range of complexity and variation;
3. Behave professionally and adhere to engineering ethics and standards;
4. Work in and lead a heterogeneous team of professionals from different engineering specialties and assume responsibility for own and team performance;
5. Recognize his/her role in promoting the engineering field and contribute in the development of the profession and the community;
6. Value the importance of the environment, both physical and natural, and work to promote sustainability principles;
7. Use techniques, skills and modern engineering tools necessary for engineering practice;
8. Assume full responsibility for own learning and self-development, engage in lifelong learning and demonstrate the capacity to engage in post- graduate and research studies;
9. Communicate effectively using different modes, tools and languages with various audiences; to deal with academic/professional challenges in a critical and creative manner;
10. Demonstrate leadership qualities, business administration and entrepreneurial skills.
11. The ability to apply knowledge of engineering sciences, including electrical circuits, power systems, control systems and electrical machines.
12. Designing the optimum operation of electrical power systems including the design, planning and operation of these systems.
13. Using knowledge of contemporary technological issues in addressing and controlling problems of electrical power systems and electrical machines and using some software as tools in solving problems.
14. Ability to use modern techniques in electrical engineering and software-based tools for conducting experiments and data interpretation.
15. Ability to understand the importance of safety precautions to be followed by society while working with different electrical installations.

7. Program Competencies

According to the National Academic Reference Standard, the program in ELECTRICAL POWER & MACHINES Engineering must satisfy the following Competencies:

1- General Engineering NARS Competencies in 2018		
Level A (NARS)	A.1	Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.
	A.2	Develop and conduct appropriate experimentation and/or simulation, analyze and interpret data, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.
	A.3	Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the discipline and within the principles and contexts of sustainable design and development.
	A.4	Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.
	A.5	Practice research techniques and methods of investigation as an inherent part of learning.
	A.6	Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.
	A.7	Function efficiently as an individual and as a member of multi-disciplinary and multi- cultural teams.
	A.8	Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.
	A.9	Use creative, innovative and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.
	A.10	Acquire and apply new knowledge; and practice self, lifelong and other learning strategies.
2- Electrical NARS Competencies in 2018		
Level B (NARS)	B.1	Select, model and analyze electrical power systems applicable to the specific discipline by applying the concepts of: generation, transmission and distribution of electrical power systems.
	B.2	Design, model and analyze an electrical/electronic/digital system or component for a specific application; and identify the tools required to optimize this design.
	B.3	Design and implement: elements, modules, sub-systems or systems in electrical/electronic/digital engineering using technological and professional tools.
	B.4	Estimate and measure the performance of an electrical/electronic/digital system and circuit under specific input excitation, and evaluate its suitability for a specific application.
	B.5	Adopt suitable national and international standards and codes to: design, build, operate, inspect and maintain electrical/electronic/digital equipment, systems and services.
3- Electrical Power and Machines ARS		

Level C (ARS)	C.1	Demonstrate the impacts of contemporary engineering solutions on society, the humanitarian interests and the environment with considering the professional ethics.
	C.2	Demonstrate understanding and knowledge of basic theories of electrical power and machines systems including low voltage systems, short circuit calculations and demonstrate the ability to apply logic circuits to diverse electrical equipment.
	C.3	Create, design and perform experiments in a safe manner using a wide range of components or equipment, as well as software packages pertaining to electrical power and machines program.
	C.4	Use modern techniques in electrical engineering and software-based tools for conducting experiments to diagnose faults and data interpretation.
	C.5	Inspect the failure of systems, process, components and also judge the engineering decisions considering high quality, reliability, balanced costs, benefits and Environmental impact.

To judge the compatibility of program objectives with its competencies, the following matrix is used:

Program Objectives	**Program Competencies**																			
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	C1	C2	C3	C4	C5
Objective #1	√				√					√						√	√			
Objective #2		√	√	√						√	√	√	√	√				√	√	
Objective #3	√				√	√					√		√		√					√
Objective #4									√				√						√	√
Objective #5							√	√												√
Objective #6																√				√

PROGRAM REQUIREMENTS

ELECTRICAL POWER & MACHINES Engineering Program Requirements

#	Requirements	Contact Hours	%	% according to reference framework
1	Humanities & Social Sciences	20	8	8-12
2	Mathematics & Basic Sciences	64	25.6	20-26
3	Basic Engineering Subjects	67	26.8	25-30
4	Applied Engineering and Design	68	27.2	25-30
5	Business Administration	7	2.8	2-4
6	Engineering Knowledge	14	5.6	3-6
7	Projects & Training	10	4	3-6
		250	100	100

#	Subjects	Contact Hours	%	Min. Percentage according to reference framework (%)
1	University Requirements	20	8	8
2	Faculty Requirements	70	28	20
3	Major Specialization Subjects	95	38	35
4	Minor Specialization Subjects	65	26	Maximum 30
		250	100	

LIST OF COURSES

ELECTRICAL POWER & MACHINES ENGINEERING PROGRAM

No.	Code	Course	Contact Hrs				Credit Hours
			Lec.	Tut.	Lab.	Total	Total
University Requirements (12+7+1=20 Contact Hours)= (12 Credit Hours)							
1	GEN0x0	Elective - Language requirements List	2	0	0	2	2
2	GEN011	Computer Skills	1	0	1	2	1
3	GEN012	History of Engineering & Technology	2	0	0	2	2
4	GEN9xx	Elective - University Requirements list	1	1	0	2	1
5	GEN9xx	Elective - University Requirements list	1	1	0	2	1
6	GEN9xx	Elective - University Requirements list	1	1	0	2	1
7	GEN9xx	Elective - University Requirements list	1	1	0	2	1
8	GEN9xx	Elective - University Requirements list	1	1	0	2	1
9	GEN9xx	Elective - University Requirements list	1	1	0	2	1
10	GEN9xx	Elective - University Requirements list	1	1	0	2	1
Faculty Requirements (23+ 23+24 =70 Contact Hours)= (41 Credit Hours)							
1	BAS010	Differential Calculus and Algebra	2	2	0	4	3
2	BAS011	Statics	2	1	2	5	3
3	BAS012	Engineering Chemistry	2	1	2	5	3
4	BAS013	Physics of Materials & Electricity	2	1	3	6	3
5	MEC010	Engineering Drawing (1)	0	3	0	3	1
5	MEC012	Engineering Drawing (2)	0	3	1	4	2
6	BAS014	Integral Calculus & Analytical Geometry	2	2	0	4	3
7	BAS015	Dynamics	2	1	2	5	3
8	BAS016	Physics of Light, Heat and Magnetism	2	1	2	5	3
9	MEC011	Principles of Manufacturing Engineering	1	0	2	3	2
10	BAS118	Differential Equations	2	2	0	4	3
11	BAS119	Special Functions and Transformations	2	2	0	4	3
12	BAS212	Partial Differential Equations and Numerical Analysis	2	2	0	4	3
13	BAS213	Statistics and Probability	2	2	0	4	3
14	ELE491	Graduation Project (1)	0	0	3	3	1
14	ELE492	Graduation Project (2)	0	0	7	7	2
00	ELE100	Summer Training (1)	0	0	0	0	0
00	ELE 200	Summer Training (2)	0	0	0	0	0
00	ELE300	Industrial Training (1)	0	0	0	0	0
00	ELE400	Industrial Training (2)	0	0	0	0	0
Major Specialization Subjects (37+28+30=95 Contact Hours) = (59 Credit Hours)							
1	MEC171	Fluid and Thermal Systems	2	1	0	3	2

2	ELE111	Electrical Circuits (1)	2	2	2	6	4
3	ELE112	Computer Programming	1	0	3	4	2
4	ELE113	Materials Science	2	1	0	3	2
5	CIV171	Civil and Surveying Engineering	2	2	1	5	3
6	ELE114	Technical Report Writing	1	0	2	3	2
7	ELE115	Signal and Systems	2	2	1	5	3
8	ELE151	Physics of Semiconductor	2	2	2	6	4
9	ELE116	Electrical Circuits (2)	2	2	1	5	3
10	ELE211	Electronic and Electrical Measurements	2	1	2	5	3
11	ELE212	Electromagnetic Fields	2	2	1	5	3
12	ELE261	Logic Design and Microprocessors	2	1	3	6	3
13	ELE218	Engineering Economics	2	2	0	4	3
14	ELE216	Project Management	1	2	0	3	2
15	ELE213	Electrical Energy Conversion	2	1	0	3	2
16	ELE214	Electrical Machines (1)	2	2	2	6	4
17	ELE215	Power Systems	2	2	2	6	4
18	ELE314	Automatic Control (1)	2	2	0	4	3
19	ELE341	Utilization of Electric Energy	2	1	2	5	3
20	ELE342	Computer Applications in Electrical Power & Machines	1	0	3	4	2
21	ELE448	Computer Applications in High Voltage	1	0	3	4	2
Minor Specialization Subjects (30+23+12=65 Contact Hours) = (41 Credit Hours)							
1	ELE311	High Voltage Engineering (1)	2	1	1	4	3
2	ELE312	Power Electronics (1)	2	2	1	5	3
3	ELE313	Power Systems Analysis (1)	2	2	1	5	3
4	ELE315	Electrical Machines (2)	2	2	1	5	3
5	ELE316	Design and Analysis of Electrical Machines	2	2	0	4	3
6	ELE317	Power Systems Analysis (2)	2	2	1	5	3
7	ELE319	Power Systems Protection (1)	2	1	2	5	3
8	ELE412	Electrical Drive Systems (1)	2	1	2	5	3
9	ELE413	High Voltage Engineering (2)	2	2	1	5	3
10	ELE414	Power Electronics (2)	2	1	2	5	3
11	ELE415	Automatic Control (2)	2	3	0	5	3
12	ELE4XX	Elective (1)	2	1	0	3	2
13	ELE4XX	Elective (2)	2	1	0	3	2
14	ELE4XX	Elective (3)	2	1	0	3	2
15	ELE4XX	Elective (4)	2	1	0	3	2

COURSES CLASSIFICATION
ELECTRICAL POWER & MACHINES ENGINEERING PROGRAM

No.	Code	Course	Contact Hrs			
			Lec.	Tut.	Lab.	Total
Humanities & Social Science Subjects (12+7+1=20 Contact Hours)						
1	GEN0x0	Elective - Language requirements List	2	0	0	2
2	GEN011	Computer Skills	1	0	1	2
3	GEN012	History of Engineering & Technology	2	0	0	2
4	GEN9xx	Elective - University Requirements list	1	1	0	2
5	GEN9xx	Elective - University Requirements list	1	1	0	2
6	GEN9xx	Elective - University Requirements list	1	1	0	2
7	GEN9xx	Elective - University Requirements list	1	1	0	2
8	GEN9xx	Elective - University Requirements list	1	1	0	2
9	GEN9xx	Elective - University Requirements list	1	1	0	2
10	GEN9xx	Elective - University Requirements list	1	1	0	2
Business Administration (3+4+0=7 Contact Hours)						
1	ELE218	Engineering Economics	2	2	0	4
2	ELE216	Project Management	1	2	0	3
Mathematics & Basic Sciences (28+22+14=64 Contact Hours)						
1	BAS010	Differential Calculus and Algebra	2	2	0	4
2	BAS011	Statics	2	1	2	5
3	BAS012	Engineering Chemistry	2	1	2	5
4	BAS013	Physics of Materials & Electricity	2	1	3	6
5	BAS014	Integral Calculus & Analytical Geometry	2	2	0	4
6	BAS015	Dynamics	2	1	2	5
7	BAS016	Physics of Light, Heat and Magnetism	2	1	2	5
8	BAS118	Differential Equations	2	2	0	4
9	BAS212	Partial Differential Equations and Numerical Analysis	2	2	0	4
10	BAS213	Statistics and Probability	2	2	0	4
11	ELE113	Materials Science	2	1	0	3
12	BAS119	Special Functions and Transformations	2	2	0	4
13	ELE151	Physics of Semiconductor	2	2	2	6
14	ELE212	Electromagnetic Fields	2	2	1	5
Engineering Knowledge Subjects (6+3+5=14 Contact Hours)						
1	MEC011	Principles of Manufacturing Engineering	1	0	2	3
2	MEC171	Fluid and Thermal Systems	2	1	0	3
3	CIV171	Civil and Surveying Engineering	2	2	1	5
4	ELE114	Technical Report Writing	1	0	2	3
Basic Engineering Science Subjects (22+22+23=67 Contact Hours)						
1	MEC010	Engineering Drawing (1)	0	3	0	3
1	MEC012	Engineering Drawing (2)	0	3	1	4
2	ELE111	Electrical Circuits (1)	2	2	2	6
3	ELE 116	Electrical Circuits (2)	2	2	1	5
4	ELE112	Computer Programming	1	0	3	4
5	ELE115	Signal and Systems	2	2	1	5
6	ELE211	Electronic and Electrical Measurements	2	1	2	5

7	ELE261	Logic Design and Microprocessors	2	1	3	6
8	ELE213	Electrical Energy Conversion	2	1	0	3
9	ELE214	Electrical Machines (1)	2	2	2	6
10	ELE215	Power Systems	2	2	2	6
11	ELE341	Utilization of Electric Energy	2	1	2	5
12	ELE312	Power Electronics (1)	2	2	1	5
13	ELE342	Computer Applications in Electrical Power & Machines	1	0	3	4
Applied Engineering and Design Subjects (31+23+14=68 Contact Hours)						
1	ELE311	High Voltage Engineering (1)	2	1	1	4
2	ELE313	Power Systems Analysis (1)	2	2	1	5
3	ELE314	Automatic Control (1)	2	2	0	4
4	ELE315	Electrical Machines (2)	2	2	1	5
5	ELE316	Design and Analysis of Electrical Machines	2	2	0	4
6	ELE317	Power Systems Analysis (2)	2	2	1	5
7	ELE319	Power Systems Protection (1)	2	1	2	5
8	ELE412	Electrical Drive Systems (1)	2	1	2	5
9	ELE413	High Voltage Engineering (2)	2	2	1	5
10	ELE414	Power Electronics (2)	2	1	2	5
11	ELE415	Automatic Control (2)	2	3	0	5
12	ELE448	Computer Applications in High Voltage	1	0	3	4
13	ELE4XX	Elective (1)	2	1	0	3
14	ELE4XX	Elective (2)	2	1	0	3
15	ELE4XX	Elective (3)	2	1	0	3
16	ELE4XX	Elective (4)	2	1	0	3
Projects and Field Training Subjects (0+0+10=10 Contact Hours)						
1	ELE491	Graduation Project (1)	0	0	3	3
1	ELE492	Graduation Project (2)	0	0	7	7
0	ELE100	Summer Training (1)	0	0	0	0
00	ELE 200	Summer Training (2)	0	0	0	0
0	ELE300	Industrial Training (1)	0	0	0	0
0	ELE400	Industrial Training (2)	0	0	0	0

STUDY PLAN

PREPARATORY YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
BAS010	Differential Calculus and Algebra	2	2	0	4	60	0	60	120	3
BAS011	Statics	2	1	2	5	45	30	75	150	3
BAS012	Engineering Chemistry	2	1	2	5	45	30	75	150	3
BAS013	Physics of Materials & Electricity	2	1	3	6	45	45	90	180	3
MEC010	Engineering Drawing (1) ×	0	3	0	3	25	20	45	90	3
GEN0x0	Elective - Language requirements List	2	0	0	2	30	0	30	60	2
		10	**8**	**7**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
BAS014	Integral Calculus & Analytical Geometry	2	2	0	4	60	0	60	120	3
BAS015	Dynamics	2	1	2	5	45	30	75	150	3
BAS016	Physics of Light, Heat and Magnetism	2	1	2	5	45	30	75	150	3
MEC011	Principles of Manufacturing Engineering†	1	0	2	3	25	20	45	90	3
MEC012	Engineering Drawing (2) ×	0	3	1	4	30	30	60	120	3
GEN011	Computer Skills ×	1	0	1	2	15	15	30	60	2
GEN012	History of Engineering & Technology	2	0	0	2	30	0	30	60	2
		10	**7**	**8**	**25**				**750**	

† In workshops, students are divided into groups 15 students/each, and a faculty stuff member (or an assistant) as well as a practical trainer will teach the group.

× In course MEC011, students are divided into groups 15 students/each. Two faculty stuff members or their assistants will teach each group.

FIRST YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
BAS118	Differential Equations	2	2	0	4	40	20	60	120	3
ELE111	Electrical Circuits (1) *	2	2	2	6	60	30	90	180	3
ELE112	Computer Programming	1	0	3	4	30	30	60	120	3
ELE113	Materials Science	2	1	0	3	30	15	45	90	3
ELE114	Technical Report Writing	1	0	2	3	30	15	45	90	2
CIV171	Civil and Surveying Engineering	2	2	1	5	50	25	75	150	3
		10	**7**	**8**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
BAS119	Special Functions and Transformations	2	2	0	4	40	20	60	120	3
ELE115	Signal and Systems	2	2	1	5	50	25	75	150	3
ELE151	Physics of Semiconductor	2	2	2	6	60	30	90	180	3
ELE116	Electrical Circuits (2)	2	2	1	5	50	25	75	150	3
MEC171	Fluid and Thermal Systems	2	1	0	3	30	15	45	90	3
GEN9XX	Elective from University Requirements list	1	1	0	2	20	10	30	60	2
		11	**10**	**4**	**25**				**750**	

- Prior to registering in first year, the student should have completed 3 weeks of summer training (1) (ELE100) for 3 weeks in summer for 5 days per week. The daily training is for 5 hours (2 hrs Lecture + 3 hrs tutorial), amounting to a total of 25 hours per week. A maximum grade of 25 marks is added to the 'semester work' grades of the “electrical circuits (1)” course (ELE111).

SECOND YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
ELE211	Electronic and Electrical Measurements	2	1	2	5	50	25	75	150	3
ELE212	Electromagnetic Fields	2	2	1	5	50	25	75	150	3
ELE261	Logic Design and Microprocessors	2	1	3	6	60	30	90	180	3
ELE213	Electrical Energy Conversion	2	1	0	3	30	15	45	90	2
BAS212	Partial Differential Eqs. & Numerical Analysis	2	2	0	4	60	0	60	120	3
GEN9XX	Elective from University Requirements list	1	1	0	2	20	10	30	60	2
		11	**8**	**6**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
ELE214	Electrical Machines (1)	2	2	2	6	60	30	90	180	3
ELE215	Power Systems	2	2	2	6	60	30	90	180	3
ELE216	Project Management	1	2	0	3	30	15	45	90	2
BAS213	Statistics and Probability	2	2	0	4	60	0	60	120	3
ELE218	Engineering Economics	2	2	0	4	40	20	60	120	2
GEN9XX	Elective from University Requirements list	1	1	0	2	20	10	30	60	2
		10	**11**	**4**	**25**				**750**	

- Prior to registering in second year, the student should have completed 3 weeks of summer training (2) (ELE200) for 3 weeks in summer for 5 days per week. The daily training is for 5 hours (2 hrs Lecture + 3 hrs tutorial), amounting to a total of 25 hours per week. A maximum grade of 25 marks is added to the 'semester work' grades of the "Logic Design and Microprocessors" course (ELE261).

THIRD YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
ELE311	High Voltage Engineering (1)	2	1	1	4	40	20	60	120	3
ELE312	Power Electronics (1)	2	2	1	5	40	20	60	120	3
ELE313	Power Systems Analysis (1)	2	2	1	5	50	25	75	150	3
ELE314	Automatic Control (1)	2	2	0	4	40	20	60	120	3
ELE315	Electrical Machines (2)	2	2	1	5	50	25	75	150	3
GEN9XX	Elective from University Requirements list	1	1	0	2	20	10	30	60	2
ELE300	Field Training (1)	0	0	0	0	15	15	0	30	-
		11	**10**	**4**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
ELE341	Utilization of Electric Energy	2	1	2	5	50	25	75	150	3
ELE316	Design and Analysis of Electrical Machines	2	2	0	4	40	20	60	120	3
ELE317	Power Systems Analysis (2)	2	2	1	5	50	25	75	150	3
ELE319	Power Systems Protection (1)	2	1	2	5	50	25	75	150	3
ELE342	Comp. App. in Electrical Power & Machines	1	0	3	4	40	20	60	120	3
GEN9XX	Elective from University Requirements list	1	1	0	2	20	10	30	60	2
		10	**7**	**8**	**25**				**750**	

- Prior to registering in third year, the student undergoes field training -1 (ELE300) for 4 weeks during the summer vacation, in a factory, company, firm or project site …etc in a related field. Every 5 students are supervised by a staff member of the department, (this supervision is not included in the staff member's teaching load).

FOURTH YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
ELE412	Electrical Drive Systems (1)	2	1	2	5	50	25	75	150	3
ELE413	High Voltage Engineering (2)	2	2	1	5	40	20	60	120	3
ELE414	Power Electronics (2)	2	1	2	5	50	25	75	150	3
ELE415	Automatic Control (2)	2	3	0	5	50	25	75	150	3
ELE491	Graduation Project (1)	0	0	3	3	40	50	0	90	-
GEN9XX	Elective from University Requirements list	1	1	0	2	20	10	30	60	2
ELE400	Field Training (2)	0	0	0	0	15	15	0	30	-
		9	**8**	**8**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
GEN9XX	Elective from University Requirements list	1	1	0	2	20	10	30	50	2
ELE448	Computer Applications in High Voltage	1	0	3	4	30	30	60	120	2
ELE4XX	Elective (1) – List (1)	2	1	0	3	30	15	45	90	3
ELE4XX	Elective (2) – List (2)	2	1	0	3	30	15	45	90	3
ELE4XX	Elective (3) – List (3)	2	1	0	3	30	15	45	90	3
ELE4XX	Elective (4) – List (4)	2	1	0	3	30	15	45	90	3
ELE492	Graduation Project (2)*	0	0	7	7	60	150	0	210	-
		10	**5**	**10**	**25**				**750**	

- Prior to registering in fourth year, the student undergoes field training -2 (ELE400) for 4 weeks during the summer vacation, in a factory, company, firm or project site …etc in a related field. Every 5 students are supervised by a staff member of the department, (this supervision is not included in the staff member's teaching load).

* After completing the second semester, the students are divided into groups and continue performing the graduation project for 4 weeks.

LIST OF TECHNICAL LANGUAGES ELECTIVE COURSES

#	Code	Contact Hours	Contact Hrs			
			Lec.	Tut.	Lab.	Total
1	GEN010	English Language	2	0	0	2
2	GEN020	German Language	2	0	0	2
3	GEN030	French Language	2	0	0	2

LIST OF ELECTIVE COURSES FROM UNIVERSITY REQUIREMENTS

#	Code	Contact Hours	Contact Hrs			
			Lec.	Tut.	Lab.	Total
1	GEN900	Communication & Presentation Skills	1	1	0	2
2	GEN901	Theory of Sustainability	1	1	0	2
3	GEN902	Human Rights and Combating Corruption	1	1	0	2
4	GEN903	Research & Analysis Skills	1	1	0	2
5	GEN904	Entrepreneurship	1	1	0	2
6	GEN905	Professional Ethics	1	1	0	2
7	GEN906	Critical Thinking	1	1	0	2
8	GEN907	Human Resources Management	1	1	0	2
9	GEN908	Contracts and Legislation	1	1	0	2
10	GEN909	Method of Scientific Research and Writing	1	1	0	2

LIST OF SPECIALIZED ELECTIVE COURSES

#	Code	Contact Hours	Contact Hrs			
			Lec.	Tut.	Lab.	Total
		List (1) of Elective Courses				
1	ELE442	Power System Planning	2	0	1	3
2	ELE444	Electrical Load Forecasting	2	0	1	3
3	ELE445	Modeling and Simulation of Electric Power Systems	2	0	1	3
4	ELE446	Smart Grid	2	0	1	3
5	ELE447	Control of Power Systems	2	0	1	3
		List (2) of Elective Courses				
1	ELE481	Advanced Topics in HV Engineering	2	0	1	3
2	ELE483	Switchgear and Circuit Breakers	2	0	1	3
3	ELE484	Power Systems Protection (2)	2	0	1	3
4	ELE485	Technology of Electric Power Station	2	0	1	3
5	ELE486	Electrical Power Plants	2	0	1	3
		List (3) of Elective Courses				
1	ELE416	Power Electronics (3)	2	0	1	3
2	ELE417	Microcontrollers	2	0	1	3
3	ELE418	Renewable Energy Systems	2	0	1	3
4	ELE419	Industrial Control	2	0	1	3
		List (4) of Elective Courses				
1	ELE441	Electrical Distribution Systems	2	0	1	3
2	ELE443	Power Quality	2	0	1	3
3	ELE482	Electrical Safety	2	0	1	3

BENHA UNIVERSITY

ELECTRICAL POWER & MACHINES ENGINEERING PROGRAM 2021

FACULTY OF ENGINEERING AT SHOUBRA

ELECTRICAL POWER & MACHINES ENGINEERING PROGRAM TREE

	First Semester	Second Semester

Elective Courses	ELE442 Power System Planning	ELE444 Electrical Load Forecasting	ELE445 Modeling and Simulation of Electric Power Systems	ELE446 Smart Grid	ELE447 Control of Power Systems	ELE481 Advanced Topics in HV Engineering	ELE483 Switchgear and Circuit Breakers	ELE484 Power Systems Protection (2)	ELE485 Technology of Electric Power Station	ELE486 Electrical Power Plants	ELE416 Power Electronics (3)	ELE417 Microcontrollers	ELE418 Renewable Energy Systems	ELE419 Industrial Control	ELE441 Electrical Distribution Systems	ELE443 Power Quality	ELE482 Electrical Safety
Prerequisite	ELE317	ELE341	ELE313	ELE313	ELE314	ELE311	ELE311	ELE319	ELE116	ELE116	ELE312	ELE261	ELE312	ELE314	ELE 341	ELE 317	ELE 311

FOURTH YEAR	ELE400 Field Training (2)	ELE412 Electrical Drive Systems (1)	ELE413 High Voltage Engineering (2)	ELE414 Power Electronics (2)	ELE415 Automatic Control (2)	ELE491 Graduation Project (1)	GEN9XX Elective GEN	GEN9XX Elective GEN	ELE448 Computer Applications in High Voltage	ELE4XX Elective (1) – List (1)	ELE4XX Elective (2) – List (2)	ELE4XX Elective (3) – List (3)	ELE4XX Elective (4) – List (4)	ELE492 Graduation Project (2)*
Prerequisite	-	ELE312	ELE311	ELE312	ELE314	-	-	-	ELE311					

THIRD YEAR	ELE311 High Voltage Engineering (1)	ELE312 Power Electronics (1)	ELE313 Power Systems Analysis (1)	ELE314 Automatic Control (1)	ELE315 Electrical Machines (2)	GEN9XX Elective GEN	ELE300 Field Training (1)	ELE341 Utilization of Electric Energy	ELE316 Design and Analysis of Electrical Machines	ELE317 Power Systems Analysis (2)	ELE319 Power Systems Protection (1)	ELE342 Comp. App. in Electrical Power & Machines	GEN9XX Elective GEN
Prerequisite	ELE212	ELE116	ELE215	ELE115	ELE214	-	-	ELE212	ELE214	ELE116	ELE116	ELE215	-

BENHA UNIVERSITY

ELECTRICAL POWER & MACHINES ENGINEERING PROGRAM 2021

FACULTY OF ENGINEERING AT SHOUBRA

	First Semester						Second Semester					
SECOND YEAR	ELE211 Electronic and Electrical Measurements	ELE212 Electromagnetic Fields	ELE261 Logic Design and Microprocessors	ELE213 Electrical Energy Conversion	BAS212 Partial Differential Eqs. & Numerical Analysis	GEN9XX Elective GEN	ELE214 Electrical Machines (1)	ELE215 Power Systems	ELE216 Project Management	BAS213 Statistics and Probability	ELE218 Engineering Economics	GEN9XX Elective GEN
Prerequisite	ELE151	BAS013	ELE112	ELE111	BAS113	-	ELE116	ELE116	-	BAS113	-	-

	First Semester						Second Semester					
FIRST YEAR	BAS112 Differential Equations	ELE111 Electrical Circuits (1) *	ELE112 Computer Programming	ELE113 Materials Science	ELE114 Technical Report Writing	CIV171 Civil and Surveying Engineering	BAS113 Special Functions and Transformations	ELE115 Signal and Systems	ELE151 Physics of Semiconductor	ELE116 Electrical Circuits (2)	MEC171 Fluid and Thermal Systems	GEN9XX Elective GEN
Prerequisite	BAS010	BAS013	GEN011	BAS016	-	-	BAS014	BAS010	BAS013	BAS013	BAS013	-

	First Semester						Second Semester						
PREPARATORY YEAR	BAS010 Differential Calculus and Algebra	BAS011 Statics	BAS012 Engineering Chemistry	BAS013 Physics of Materials & Electricity	MEC010 Engineering Drawing (1) ×	GEN010 Technical English Language	BAS014 Integral Calculus & Analytical Geometry	BAS014 Dynamics	BAS016 Physics of Light, Heat and Magnetism	MEC011 Principles of Manufacturing Engineering†	MEC012 Engineering Drawing (2) ×	GEN011 Computer Skills ×	GEN012 History of Engineering & Technology

Matrix relating the program courses with competencies

Course Code	Course Name	Engineering Competencies (2018)										"Department" Electrical Engineering Competencies (NARS)					"Discipline" Electrical Engineering and Control Competencies (ARS)				
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	C1	C2	C3	C4	C5
GEN010	Technical English Language		√					√	√	√											
GEN011	Computer Skills		√						√		√										
GEN012	History of Engineering & Technology	√		√	√				√												
GEN900	Communication & Presentation Skills		√			√			√	√											
GEN902	Human Rights and Combating Corruption			√				√	√	√											
GEN903	Research & Analysis Skills		√			√		√	√												
GEN904	Entrepreneurship			√																	
GEN905	Professional Ethics			√					√	√											
GEN906	Critical Thinking								√	√	√										
GEN907	Human Resources Management				√	√	√	√		√											
BAS010	Differential Calculus and Algebra	√							√												
BAS011	Statics	√			√				√												
BAS012	Engineering Chemistry	√	√					√	√												
BAS013	Physics of Materials & Electricity	√	√					√	√												
MEC010	Engineering Drawing (1)	√					√		√												
MEC012	Engineering Drawing (2)	√			√				√												
BAS014	Integral Calculus & Analytical Geometry	√							√												

Course Code	Course Name	Engineering Competencies (2018)										"Department" Electrical Engineering Competencies (NARS)					"Discipline" Electrical Engineering and Control Competencies (ARS)				
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	C1	C2	C3	C4	C5
BAS015	Dynamics	√			√	√			√												
BAS016	Physics of Light, Heat and Magnetism	√			√	√			√												
MEC011	Principles of Manufacturing Engineering	√	√				√		√		√										
ELE100	Summer Training (1)																				
BAS118	Differential Equations	√				√	√	√			√										
BAS119	Special Functions and Transformations	√				√	√	√			√										
MEC171	Fluid and Thermal Systems	√		√	√				√												
ELE111	Electrical Circuits (1)	√	√				√		√			√									
ELE112	Computer Programming	√	√	√				√	√	√			√		√						
ELE113	Materials Science	√	√	√				√	√	√			√		√						
CIV171	Civil and Surveying Engineering	√	√	√				√	√	√			√		√						
ELE114	Technical Report Writing				√	√	√				√										
ELE115	Signal and Systems	√	√	√					√				√		√						
ELE151	Physics of Semiconductor	√	√			√	√		√				√	√	√						
ELE116	Electrical Circuits (2)	√	√						√			√			√						
BAS212	Partial Differential Equations and Numerical Analysis	√	√	√				√			√		√		√						
BAS213	Statistics and Probability	√	√	√				√			√		√		√						
ELE 200	Summer Training (2)																				

Course Code	Course Name	Engineering Competencies (2018)										"Department" Electrical Engineering Competencies (NARS)					"Discipline" Electrical Engineering and Control Competencies (ARS)				
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	C1	C2	C3	C4	C5
ELE211	Electronic and Electrical Measurements	√	√		√		√				√			√		√					√
ELE212	Electromagnetic Fields	√				√		√	√			√									
ELE261	Logic Design and Microprocessors	√	√	√	√		√	√		√			√			√					
ELE218	Engineering Economics			√					√	√											
ELE216	Project Management					√		√	√	√	√										
ELE213	Electrical Energy Conversion		√	√		√			√		√	√	√		√				√	√	√
ELE214	Electrical Machines (1)	√	√	√							√				√			√	√		
ELE215	Power Systems	√	√	√					√			√	√						√		
ELE300	Industrial Training (1)																				
ELE311	High Voltage Engineering (1)		√				√	√			√	√			√				√		
ELE312	Power Electronics (1)		√				√				√		√		√			√		√	
ELE313	Power Systems Analysis (1)								√		√		√	√			√			√	√
ELE314	Automatic Control (1)	√	√						√		√		√		√		√			√	
ELE315	Electrical Machines (2)		√		√		√				√	√			√	√	√		√		
ELE316	Design and Analysis of Electrical Machines		√	√		√			√		√	√	√		√				√	√	√
ELE317	Power Systems Analysis (2)	√	√	√					√				√			√	√	√			
ELE319	Power Systems Protection (1)		√				√				√		√	√			√			√	√
ELE341	Utilization of Electric Energy		√				√				√		√	√			√			√	√

Course Code	Course Name	Engineering Competencies (2018)										"Department" Electrical Engineering Competencies (NARS)					"Discipline" Electrical Engineering and Control Competencies (ARS)				
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	C1	C2	C3	C4	C5
ELE342	Computer Applications in Electrical Power & Machines		√				√				√		√		√		√			√	
ELE 400	Industrial Training (2)																				
ELE412	Electrical Drive Systems (1)		√	√		√			√		√	√	√		√				√	√	√
ELE413	High Voltage Engineering (2)		√	√	√		√		√		√		√	√	√		√			√	√
ELE414	Power Electronics (2)		√	√		√		√	√		√	√		√	√		√			√	√
ELE415	Automatic Control (2)		√	√	√						√		√		√		√			√	√
ELE448	Computer Applications in High Voltage		√		√		√				√	√			√		√		√		
ELE491	Graduation Project (1)		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
ELE492	Graduation Project (2)		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	ELECTIVE COURSES																				
ELE442	Power System Planning	√	√	√					√				√			√	√	√			
ELE444	Electrical Load Forecasting			√				√			√		√	√			√			√	√
ELE445	Modeling and Simulation of Electric Power Systems		√		√	√		√	√			√			√			√	√		
ELE446	Smart Grid		√			√		√	√		√	√				√			√		√
ELE447	Control of Power Systems		√				√				√	√			√			√	√		
ELE481	Advanced Topics in HV Engineering			√	√		√				√			√		√		√			
ELE483	Switchgear and Circuit Breakers		√		√	√	√	√			√	√		√	√		√			√	√

Course Code	Course Name	Engineering Competencies (2018)										"Department" Electrical Engineering Competencies (NARS)					"Discipline" Electrical Engineering and Control Competencies (ARS)				
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	C1	C2	C3	C4	C5
ELE484	Power Systems Protection (2)			√		√		√	√		√		√		√		√			√	√
ELE485	Technology of Electric Power Station		√		√	√		√	√					√	√		√	√			
ELE486	Electrical Power Plants		√	√					√		√	√	√		√	√	√		√		
ELE416	Power Electronics (3)		√	√	√		√				√		√	√		√	√			√	√
ELE417	Microcontrollers		√				√				√		√	√					√		√
ELE418	Renewable Energy Systems								√		√		√			√	√	√			
ELE419	Industrial Control		√	√	√		√				√		√	√		√		√	√		
ELE441	Electrical Distribution Systems			√	√		√				√			√		√	√	√			
ELE443	Power Quality		√			√		√	√		√	√				√		√	√	√	√
ELE482	Electrical Safety	√						√	√		√	√			√		√	√			

Courses Description

PREPARATORY YEAR

BAS010 Differential Calculus and Algebra (2,2,0)

Differentiation: Elementary functions, Polynomials, Exponential, Logarithmic and trigonometric functions, Limits and continuity, Derivative, Implicit differentiation, Maximum and minimum values, Mean value theorem, Taylor's expansion, Integration of Polynomials, Exponential and trigonometric functions, Definite integral.
Algebra: Matrices, Algebra of matrices, Eigenvalues and eigenvectors, Positive and negative matrices, Linear systems, Finite series, Complex numbers, Mathematical induction.
References:

1- Basic Technical Mathematics with Calculus Kindle Edition, Pearson; 11th Edition, 2017.
2- Textbook of Basic Mathematics: A Begginer's Guide To Geometry, Trigonometry and Calculus Kindle Edition, , 2017.

BAS011 Statics (2,1,2)

Application on space vectors, resultant of a set of forces, moments, equivalent couple moment, equations of equilibrium for rigid body, types of supports, statically determinate beams and trusses, equilibrium under influence of spatial forces and couples, center of mass (for particles and planer surface), moment of inertia (parallel axes, major axes, planer surface).
References:

1- Engineering Mechanics: Statics & Dynamics by Russell Hibbeler, Pearson; 14th Edition, 2015.

BAS012 Engineering Chemistry (2,1,2)

Gaseous state (gases law), chemical equilibrium and Le Chatellier, principle –solutions- phase diagram- basics of water treatment and desalination technology- Introduction on thermo chemistry and its rules, basics of fuel combustion, calorimetric and determination of heat of combustion –Electrochemistry and conduction in electrolytic solutions Electrochemical cells and Nernst equation- Corrosion of metals (types, methods of prevention of corrosion – ionic equilibrium and pH calculation- building materials and some petrochemicals industry.
References:

1- Engineering Chemistry: Alpha Science; Illustrated Edition, 2018

BAS013 Physics of Materials & Electricity (2,1,3)

Properties of matter : Physical quantities, standard units and dimensions, atomic structure (electronic distribution, classification of elements and energy levels), crystalline structure (crystalline grid, symmetry, vacuum groups, some simple examples of crystalline structure), stress and strain, mechanical properties of materials (tensile strength and yield stress, etc.,) Physical properties of liquids, viscosity, surface tension, Archimedes principles, Pascal's law, Bernoull's equation and their applications. Laboratory experiments. Electrical: charge and matter, Coulomb's law, electric field, Gauss's law, electric potential, capacitors and dielectric materials, electrical resistance and electromotive force, Ohm's law, simple electrical circuit, laboratory experiments.

References:

1- Modern Classical Physics: Optics, Fluids, Plasmas, Elasticity, Relativity, and Statistical Physics by Kip S. Thorne , Princeton University Press, 2017.
2- Basic Physics: A Self-Teaching Guide by K Kuhn, Noah Books, 2018

BAS014 Integral Calculus and Analytical Geometry (2,2,0)

Integration: Hyperbolic functions and inverse functions and their derivatives, derivatives of parametric relations, Methods of integrations, integration by partial fractions, parts, reduction and substitution, Applications of definite integrals for obtaining plane area, volumes, arc length and surface area.
Analytical geometry: Cartesian and polar coordinates, Equation of pair of lines, Equation of circle, Conic sections and their properties, Equation of plane, Equations of sphere, cone and cylinder.

References:

1- Basic Technical Mathematics with Calculus Kindle Edition, Pearson; 11th Edition, 2017.
2- Textbook of Basic Mathematics: A Begginer's Guide To Geometry, Trigonometry and Calculus Kindle Edition, , 2017.

BAS015 Dynamics (2,1,2)

Kinematics of Particle (rectilinear and curvilinear motion, Cartesian coordinates, projectile motion, natural coordinates, polar coordinates, relative motion), kinetics of Particle (acceleration force method), plane kinematics of rigid bodies (translational and rotational motion, general motion: relative velocities, instantaneous center of zero velocity, planer kinetics of rigid body, acceleration forces, work and energy, impact and momentum.

References:

1- Engineering Mechanics: Statics & Dynamics by Russell Hibbeler, Pearson; 14th Edition, 2015.

BAS016 Physics of Light, Heat and Magnetism (2,1,2)

Principles of heat and thermodynamics: Zero law, first and second Law of thermodynamics, heat transfer, gas theory, temperature measurement methods. Light and laser physics: general concepts of light, straight diffusion of light, Velocity of light diffusion, light beam, optical beams, geometric light, reflection and refraction, wave radiation modeling, wave dissipation, diffraction of light, introduction to lasers, Einstein's equations and magnification Light, Explanation of some lasers (gas, solid and liquid lasers), laser applications. Magnetism: magnetic field, Faraday magnetic law, magnetic induction, Boit-savart's law, Ampere's law, laboratory experiments.

References:

1- Modern Classical Physics: Optics, Fluids, Plasmas, Elasticity, Relativity, and Statistical Physics by Kip S. Thorne , Princeton University Press, 2017.
2- Basic Physics: A Self-Teaching Guide by K Kuhn, Noah Books, 2018

MEC010 Engineering Drawing (1) (0,3,0)

This is an introductory course teaches the basics of technical Drawing using manual drafting instruments. The topics include drawing tools, types of lines, sizes and layout of standard drawing sheets, lettering & numbering, scale use, drawing of geometrical figures, dimensioning, axonometric and isometric views, orthogonal and auxiliary projections, drawing of orthographic projection from isometric view.

References:

1- A Textbook of Engineering Drawing: Along with an Introduction to AutoCAD 2015 by Roop Lal, I K International Publishing House, 2015.

MEC011 Principles of Manufacturing Engineering (1,0,2)

The course introduces the basic concepts of production and productivity. The topics include classification of production processes, industrial safety, engineering materials, ferrous and non-ferrous alloys, steel and its types, cast iron and its types, steel and cast iron production, metal casting processes (sand casting, mold casting, centrifugal casting, wax casting, hot and cold metal forming processes (extrusion, forging, rolling, deep drawing, wire drawing, etc.), metal cutting processes (turning, milling, shaping, drilling, grinding, etc.), metal joining

techniques (welding processes, rivets, bolts … etc). Simple workshop measuring tools (Vernier caliper, micrometers, etc.), practical skills in workshops.

References:

1- Workshop Technology (Manufacturing Process) by S. K. Garg, Laxmi Publications; 3rd Revised edition, 2009.

MEC012 Engineering Drawing (2) (0,3,1)

Deduction of the missing orthogonal views, sections in machine members, hatching rules, intersections of solids and surfaces, development of surfaces, drawing of steel structures. Basics of computer aided drafting (CAD) using AutoCAD: Workspace, toolbars, coordinate systems, setting up 2D drawing environment, drawing tools in AutoCAD, object snap, modification tools in AutoCAD, texting and dimensioning in AutoCAD.

References:

1- A Textbook of Engineering Drawing: Along with an Introduction to AutoCAD 2015 by Roop Lal, I K International Publishing House, 2015.

FIRST YEAR

ELE100 Summer Training (1)

Prior to registering in the first year, the student performs a training during the summer inside the faculty, before the beginning of the first year, for 3 weeks upon Electrical Drawing and AutoCAD. A maximum grade of 25 marks is added to the 'semester work' grades of the "electrical circuits (1)" course (ELE111).

References:

1- Laboratory book (Manual of Experiments)

BAS118 Differential Equations (2,2,0)

Functions of several variables, Partial differentiation, Maximum and minimum values, Conditional extrema, Curvature, Double and triple integrals, Line integral, Ordinary differential equations, first order and higher order, Linear Systems of ordinary differential equations, Vectors analysis, Gradient, Laplace transformations, Inverse Laplace transformations.

References:

3- Differential Equations and Linear Algebra (Gilbert Strang), Wellesley-Cambridge; UK ed. Edition,2014.
4- Elementary Differential Equations and Boundary Value Problems by William E. Boyce et al., Wiley; 11th Edition, 2017.

MEC171 Fluid and Thermal Systems (2,1,0)

Basic concepts - Definitions - The first law of thermodynamics (its concomitants and applications) - The second law of thermodynamics (its correlations and its consequences) - Thermal machines - Inverted thermal machines - Entropy - Ideal gases and real gases - Reflex and non-reflexive procedures - Carnot cycle. Basic concepts of fluids - Fluid statics - Fluid flow characterization - Basic equations (mass survival - linear motion quantity - momentum torque) - Bernoulli's equation - Different applications on the equations of movement and Bernoulli's quantity - Flow in pipes and tubes - Dimensional analysis and dynamic symmetry and its applications.

References:

1- Yunus A. Cengel, Michael A. Boles, Thermodynamics: An Engineering Approach, 5th Ed. McGraw-Hill College, Boston, MA, 2006
2- Y. Cengel and John Cimbala, Fluid Mechanics Fundamentals and Applications, 3rd Ed. McGraw-Hill College, Boston, MA, 2013

ELE111 Electrical Circuits (1) (2,2,2)

Resistive circuit analysis (Δ/Y and Y/Δ transformations, node and loop analysis), circuit theorems (superposition, Thevenin's, Norton, substitution and maximum power transfer), DC circuit analysis in the time domain, transient analysis.

References:

1- Charles K. Alexander, Matthew n. o. Sadiku, Fundamentals of Electric Circuits, 5 ed., 2013.
2- B. L. Theraja, Basic electrical engineering in S.I. system of units, 2005.

ELE112 Computer Programming (1,0,3)

The course introduces the fundamental concepts of procedural programming. Topics include algorithms and problem solving, data types, control structures, functions, arrays, files, and the mechanics of running, testing, and debugging. Concepts of Object Orientation Programming, Introduction to Unified Modeling Language (UML) Design, Applications with C/C++/C# languages.

References:

1- MathWorks , Learning MATLAB, Fourth Edition, MathWorks, 2014
2- Structured Programming with C++ by Kjell Backman, BookBoon 2012.

ELE113 Materials Science (2,1,0)

Atoms and atomic structure, Materials Classification, Conductors, High/low - Resistive Materials, Semiconductors, Insulators, Magnetic Materials, Study and Measurement of Electrical, Magnetic, and Optical Properties of Materials, Materials for Electronic Components.

References:

1- S. O. Kasap, Principles of Electrical Engineering Materials, McGraw - Hill, 2000

ELE114 Technical Report Writing (1,0,2)

Introduction, Audience Analysis, Report Purposes, Data Gathering - Report Organization, Textual Report Elements, Graphical Report Elements, Writing Style, Grammar, Punctuation & Spelling.

References:

1- D. G. Riordan, Technical Report Writing Today, 10th ed. Cengage Advantage, 2013
2- W. S. Pfeiffer and K. A. Adkins, Technical Communication: A Practical Approach, Pearson Higher Education, 8th ed., 2013

CIV171 Civil and Surveying Engineering (2,2,1)

An Overview of the Building Delivery Process, Loads on Buildings, Load Resistance—The Structural Properties of Materials, Structural systems, Thermal Properties of Materials, Fire - Related Properties, Principles of Sustainable Construction. Materials and systems of construction: The Material Steel and Structural Steel Construction, Lime, Portland Cement and Concrete, Concrete Construction, Soils; Foundation and basement Construction, Masonry Materials, Roofing, Stairs, Floors Coverings, Mapping and surveying science, Surveying maps, Methods of calculating coordinates.

References:

1- Madan Mehta, Walter Scarborough, Diane Armpriest, Building Construction: Principles, Materials, and Systems, Prentice Hall, 2009

BAS119 Special Functions and Transformations (2,2,0)

Periodic functions, Fourier series, Fourier integrals, Special functions, Gamma, Beta, Green function, Bessel functions, Z-transform, Inverse Z-transform, Integral equations.

References:

1- K. A. Stroud, Engineering Mathematics, Fifth Edition, Industrial Press Inc., New York. 2001.
2- E. Kreyszig, Advanced Engineering Mathematics, John Wiley and Sons, New York 1999.

ELE115 Signal and Systems (2,2,1)

Introduction, fundamentals and basic properties of signals and systems, definition of open loop and closed loop systems, mathematical models of physical systems (mechanical, electrical, electromechanical systems …), control system components, block diagram simplification, signal flow graph, state variable models, Z-Transform and its properties, solving difference equations, pulse transfer function of discrete system, Fourier transforms, continuous and discrete signal analysis, transient response of first and second order control systems, real life applications such as analog and digital filters, introduction to basics of digital signal processor (DSP) and its features and capabilities of commercial applications.

References:

1- E. W. Kamen and B. S. Heck, Fundamentals of Signals and Systems Using the Web and MATLAB, 3rd ed., Pearson Hihgher Education, 2006.

ELE151 Physics of Semiconductor (2,2,2)

Semiconductors, p-n junction, diode current components, junction capacitance, junction diode as a circuit element, special p-n junctions, bipolar junction transistor and field effect transistor, Thyristors, Electronic amplifier theory, power amplifiers, Differential amplifiers, Operational amplifiers, filters and Oscillators.

References:

1- S. Sedra, K. C. Smith, Microelectronic Circuits, 6th ed., Oxford University Press, 2009
2- Nilson & Ridel, “Electric Circuits”, 9th edition, 2011.

ELE116 Electrical Circuits (2) (2,2,1)

Frequency domain phasor representation of AC circuits using complex variables, AC circuit analysis methods (nodal, mesh and circuit theorems: source transformation, superposition, Thevenin and Norton), AC power, effective value, maximum power transfer theorem, transformer circuit analysis, series, parallel and coupled resonance circuits, operational amplifier as a circuit concept: properties and applications, Three phase voltage sources, analysis of the balanced Y-Y circuit, analysis of the Y-Δ, Δ-Y, and Δ-Δ circuits, complex power calculation in three phase, unbalanced and four wire three phase loads, unbalanced Y loads with neutral (wire disconnected) or having Zo. Two-port network.

References:

1- Charles K. Alexander, Matthew n. o. Sadiku, Fundamentals of Electric Circuits, 5 ed., 2013.
2- B. L. Theraja, Basic electrical engineering in S.I. system of units, 2005.

SECOND YEAR

ELE200 Summer Training (2)

Prior to registering in the second year, the student performs a training during the summer inside the faculty, before the beginning of the second year, for 3 weeks upon different electrical software packages such as Proteus , MATLAB, PLC, AutoCAD, Classic control, … etc. A maximum grade of 25 marks is added to the 'semester work' grades of the "Logic Design and Microprocessors" course (ELE261).

References:

1- Laboratory book (Manual of Experiments)

ELE211 Electronic and Electrical Measurements (2,1,2)

Measurement errors, Classical electromechanical instruments, Electromechanical Ammeters, Voltmeters, and Ohmmeters, Digital Voltmeters, Multimeters, and frequency meters, Inductance and capacitance measurements, Classical AC bridge methods, Analog and digital Oscilloscopes, Power and Energy Measurement, Introduction to transducers, Telemetry.

References:

1- David A. Bell, Electronic Instrumentation and Measurements, 3/e, Oxford University Press, 2013.

ELE212 Electromagnetic Fields (2,2,1)

Vector analysis, Electrostatic fields: Coulomb's law and electric field intensity, electric flux density, Gauss's law and divergence, energy and potential, conductors, dielectrics and capacitance, Poisson and Laplace equations. Steady magnetic fields: Magnetostatic fields: Biot-Savart's law, Ampere's law, curl and Stokes's theorem, magnetic flux density, magnetic forces, Lorentz force, materials and inductance, series and parallel resonance, Time-varying fields, Faraday's law, Lenz's law, Maxwell's equations, power flow and Poynting theorem, skin effect concept, computation of AC impedance, losses in ferromagnetic materials, electromagnetic shielding.

References:

1- William H. Hyat, Jr. John A. Buck, Engineering Electromagnetics, Sixth edition, Mc Graw-Hill, 2011.
2- C.R. Paul, K.W.White and S. Y. Nasar, "Introduction to electromagnetic fields", 5th edition, Mc. Graw - Hill Book Company, New York, 2008.

ELE261 Logic Design and Microprocessors (2,1,3)

Binary system, Boolean Algebra, Logic Gates, Simplification of Boolean Functions, Karnaugh Maps, Analysis of combinational Circuits, design of Binary Adders, Subtractors, Encoders, Decoders, Multiplexers, Magnitude Comparators, Sequential Circuits, Flip-Flops, parallel load registers, Shift Registers, Counters, Memory Units, Introduction and historical review about microprocessors, Computer architecture, Difference between microprocessor and microcontroller, Definition of a CPU The 8 bits CPU, Assembly language for the used processor, Different busses of the microprocessor and the function and properties of each, Addressing modes, Interfacing with memory, Interfacing with input and output ports.

References:

1- Digital Design, Fifth Edition, M. Morris Mano and Michael D. Cilettii, 2016.

ELE213 Electrical Energy Conversion (2,1,0)

Overview of the energy supply primary sources& global issues, Key problems & concerns related to energy, Basics of different types of renewable and clean energy, Project Environmentally evaluation, Types of Evaluation, Case study.

References:

1- Electrical Energy Conversion and Transport: An Interactive Computer-Based Approach (IEEE Press Series on Power Engineering Book 64) 2nd Edition, Kindle Edition, Wiley-IEEE Press; 2013.

BAS212 Partial Differential Equations and Numerical Analysis (2,2,0)

Partial Differentiation and Derivatives of vector functions. Gradient/ Divergence/curl/Laplacian. Line integrals, line integrals independent of the path, exactness. Conservative vector fields. Double integrals in Cartesian and polar coordinates, Mathematical expectation, Numerical methods: Finding roots using bisection method, Newton's method, Solution of linear system of equations using Gauess method and matrix decomposition, Solution of partial D.E. (Heat and Wave equations), Lagrange and Newton Interpolation methods.

References:

1- E. Kreyszig, Advanced Engineering Mathematics, John Wiley and Sons, New York 1999

ELE214 Electrical Machines (1) (2,2,2)

Principles of operation, construction and phasor diagram of single phase transformer, Equivalent circuit and transformer tests, Three phase transformer, connections and Parallel operation of transformers, Construction of DC machines and magnetic circuit, EMF eq., developed torque, windings, and Armature reaction and commutation of DC machines, Different circuits, power flow, and efficiency of DC motor, Different circuits, power flow, and efficiency of DC generator.

References:

1- S. J. Chapman, Electric Machinery Fundamentals, 5th ed, MCGraw, 2012
2- N. K. De and P. K. Sen, "Electrical machines ", Phi Learning, 2009

ELE215 Power Systems (2,2,2)

Introduction, fundamentals and basics of electrical power engineering, definition of transmission systems and tie-lines of electrical energy networks, introduction of electrical distribution systems, substations and circuit breakers, DC power transmission systems designs, grounding cables, types of cables, transients and dynamics of over voltages in high voltage systems, over voltage protection equipment, electrical insulation coordination.

References:

1- M. S. Naidu,High Voltage Engineering,2009.
2- B. L. Theraja, A textbook of electrical and technology in S.I. system of units,Vol. III, 2005.

ELE216 Project Management (1,2,0)

Project management overview, organizational structuresو assessing success, planning, learning curves, network scheduling techniques, CPM analysis, precedence networking, resource allocation and constraints, cost management, risk management, project performance measurement and control.

References:

1- A Guide to the Project Management Body of Knowledge: PMBOK® Guide ,Project Management Institute; Sixth Edition, 2017.

BAS213 Statistics and Probability (2,2,0)

Introduction in statistics and data analysis, Measures of central tendency, Measures of dispersion, Probability theory, Conditional probability, Random variable, Probability density function, Discrete probability distributions, Continuous probability distributions, Curve fitting, Linear regression, Nonlinear regression, Covariance, Correlation Coefficient, Inferences including the mean, Inferences include differences, Quality control.

References:

1- Joe D. Hoffman, Numerical methods for engineers and scientists, 2nd edition, Marcel Dekker, Inc. New York, 2001
2- John Schiller, R. Alu Srinivasanand Murray R. Spiegel, Schaum's Outline of Probability and Statistics, 4th ed.,McGraw Hill 2012.

ELE218 Engineering Economics (2,2,0)

Introduction to economics: economic concepts, types of market, supply and demand law, flexibility, different economic systems, income and cash flow calculation, corporate objectives, balance sheet. Introduction to Engineering Economics: Engineering decision-making, break-even analysis, recovery time method, and production function. Time value of money: simple interest, compound interest, principle of economic parity and separate cash flow, trade-offs between projects, nominal interest rate and real rate. Internal Rate of Return (IRR): calculation of the internal rate of return achieved using the present wealth equation, calculation of the internal rate of return realized using the equivalent annual wealth formula and calculating the internal rate of return for several alternatives using the annual equivalent equation. Depreciation models: the nature of depreciation, calculation of depreciation rates by conventional methods.

References:

1- Leland Blank & Anthony Tarquin, Basics of Engineering Economy, McGraw - Hill, 2008

THIRD YEAR

ELE300 Field Training (1) (0,0,0)

Students should spend 4 weeks in field training, after completing the Second level, in any Engineering Institution or Engineering Firms. Students should demonstrate the professional and practical skills they acquired during discussion with their assigned tutors.

References:

ELE311 High Voltage Engineering (1) (2,1,1)

Introduction to high voltage, uniform and non-uniform fields, breakdown in gaseous insulation, breakdown in liquid insulation, breakdown in solid insulation, generation of high voltage DC, generation of high voltage AC, generation of impulse voltage, measurements for different types of HV, sources and controlling of overvoltage in power system.

References:

1- D E.kuffel, W.S. Zaengle and J. Kuffel, "High voltage engineering, Fundamentals", Newnes, Second edition reprint, 2001.
2- M. Khalifa, " High voltage Engineering- Theory and Practice", Marcel Dekker, Inc., Second Edition, 2000.

ELE312 Power Electronics (1) (2,2,1)

Converter Classification, Power semiconductor switches, operation of single phase rectifier circuit (uncontrolled and controlled) fed from ideal and non-ideal supply with types of load. Performance and operation of three phase rectifier circuit with different loads, Single- and three-phase voltage-source inverters, PWM technique.

References:

1- M. H. Rashid, Power Electronics: Circuits, Devices, and Applications, 3rd Ed., Prentice Hall, 2004
2- D. W. Hart, Power Electronics, Mc Graw Hill, 2011

ELE313 Power Systems Analysis (1) (2,2,1)

Single line diagram of power system, the per unit system, Bus admittance matrix, Bus impedance matrix, Internal voltage of loaded machines under faults conditions, The symmetrical components of unbalanced phasors, Power in terms of symmetrical components, Sequence circuits of $\Delta\&\Delta$ impedance, Unsymmetrical faults on power systems and single line to ground faults, Line to line faults and double line to ground faults.

References:

1- Leonard L. Grigsby, Electric Power Generation, Transmission, and Distribution, Third Edition, 2012.
2- U.A.Bakshi, and M.V.Bakshi, Transmission And Distribution, 4th Edition, 2009.

ELE314 Automatic Control (1) (2,2,0)

Concept of stability analysis, concept and effect of poles and zeros, frequency response analysis, polar plots, concept of stability in control systems, Routh's stability criterion, Nyquist stability criterion, application of Nyquist stability criterion on Bode plots, root locus method.

References:

1- Benjamin C. Kuo " Automatic control systems" 9th ed., John Wiley & Sons, Inc. 2010.
2- Katsuhiko Ogata, "Modern Control Engineering", 4th Edition, 2001.

ELE315 Electrical Machines (2) (2,2,1)

Construction of three-phase machines, Winding of alternating current machines, EMF equation of ac machines, MMF equation of ac machines, Synchronous machines, Induction machines.

References:

1- Fitzgerald A.E., "Electrical machinery", McGraw-Hill,2014.
2- S. J. Chapman, Electric Machinery Fundamentals, 5th Edition, McGraw-Hill, 2012

ELE341 Utilization of Electric Energy (2,1,2)

Illumination, properties of light, quantities and units, inverse square Law and cosine law, Types of lamps and their characteristics, Road lighting, Electric Heating and welding methods, Dielectric heating, induction heating and resistance furnaces, Direct Energy Conversion, Traction, lifts, UPS Standby power systems, Batteries, fuel cells, solar cells.

References:

1- B. Gupta, Utilization of Electric Power and Electric Traction, 9th ed, Kataria & Sons publishers, 2004.

ELE316 Design and Analysis of Electrical Machines (2,2,0)

Universal Motors: Construction and theory of universal motors- Performance equations of the universal motor-Speed control of universal motor-Design of universal motors-Troubles of the universal motor. Two-phase induction motors: Balanced operation of the 2-phase induction motor-Unbalanced operation of the 2-phase induction motor-Analysis of unsymmetrical 2-phase induction motor fed from unbalanced 2-phase supply. Single-phase induction motors: Theory of single-phase induction motors-Main parts of single-phase induction motors-Methods of staring single-phase induction motors-Analysis of different types single phase induction motors- Design of single-phase induction motors-Troubles of single-phase induction motors. Design of small single-phase transformers: Design for given flux density and cross-sectional area of the core-Design for given turns per volt and flux density. Linear induction motors: Synchronous velocity- Single-sided and double-sided linear induction motors-End Effects-Performance of the linear induction motors- Applications of the linear induction motors . Stepper motors: Variable-reluctance stepper motors-Permanent-magnet stepper motors-Hybrid stepper motors-Resolution and speed of stepper motors-Drive Circuits-Computer control of stepper motors-Applications of stepper motors-Terminology of stepper motors.

References:

1- Steady State, Transients, and Design with Matlab", CRC Press,2009
2- T. Wildi," Electrical Machines, Drive and Power Systems", Prentice Hall. 2008

ELE317 Power Systems Analysis (2) (2,2,1)

Power flow equations, Gauss-Seidel power flow solution, Newton Raphson power flow solution, Synchronous generator for power control, Tap changing transformers, Non-linear function optimization, Economic dispatch neglecting losses and no generator limits, Economic dispatch neglecting losses and including generator limits, Economic dispatch including losses. The stability problem, Rotor dynamics and swing equation, The power equation and synchronizing power coefficients, Equal-area criterion of stability, Step-by-step solution of the swing curve, Factors affecting transient stability.

References:

1- A textbook of Power Systems Engineering by R. K. Rajput, 2007.
2- Leonard L. Grigsby, Electric Power Generation, Transmission, and Distribution, Third Edition, 2012

ELE319 Power Systems Protection (1) (2,1,2)

Zones of protection and general principles of protection, Types of relays and construction of over current relays, Directional relays, Earth fault protection, Differential protection, Protection of transformers, Protection of motors, Protection of generators, Protection of line and distance protection, Circuit breakers and Fuses study, Instrument transformers.

References:

1- P. M. Anderson, Power System Protection, Wiley, Interscience 2009.

ELE342 Computer Applications in Electrical Power & Machines (1,0,3)

Computer-aided analysis of electrical machines: steady-state performance of DC, induction and synchronous machines. Concepts of analog and digital computer. Representation using flow charts. Programming principles: direct programming. Solution of linear and non-linear equations; solution methods for linear and algebraic equations. Programming of different elements in electrical power, programming of element calculation in circuit, programming of symmetrical and unsymmetrical methods in calculation of power flow. Solution of differential equation by partial fraction with finite time method. finite elements. Method of optimal solution. Method of charge representation. concept of limits elements.

References:

1- W. Y. Yang et al., "Applied Numerical Methods Using Matlab®", John Wiley & Sons, Inc., 2015.
2- S. T. Karris, "Introduction to Simulink® with Engineering Applications", Orchard Publications, 2016.

FOURTH YEAR

ELE400 Field Training (2) (0,0,0)

3- Students should spend 4 weeks in field training, after completing the Second level, in any Engineering Institution or Engineering Firms. Students should demonstrate the professional and practical skills they acquired during discussion with their assigned tutors.

4- *References:*

ELE412 Electrical Drive Systems (1) (2,1,2)

Elements of drive systems, Drive classifications and characteristics, Motor ratings in drive systems, Load profiles and characteristics, DC motor drives fed from single-phase controlled rectifiers and three-phase controlled rectifiers.

References:

1- M. Ahmad,"High Performace AC drives: Modeling, Analysis and Control", Springer London, 2010.
2- M. Elsharkawi, "Fundamentals of Electric Drives", Cenage Engineering, 2009

ELE413 High Voltage Engineering (2) (2,2,1)

Electrical Safety and Electrical Hazards, Grounding Principles and Practices, Non-Destructive Testing Techniques, Biological Effects of Power Frequency Electromagnetic Fields Emanating from Power Lines, Overvoltage in Electrical Power Systems, Insulation Co-ordination. Applications of High-Voltage Engineering in Industry.

References:

1- D E.kuffel, W.S. Zaengle and J. Kuffel, “High voltage engineering, Fundamentals”, Newnes, Second edition reprint, 2001.
2- M. Khalifa, “ High voltage Engineering- Theory and Practice”, Marcel Dekker, Inc., Second Edition, 2000.

ELE414 Power Electronics (2) (2,1,2)

Single-phase AC voltage controllers using on/off control, Single-phase AC voltage controllers using phase-angle control, Three-phase AC voltage controllers, Three-phase, Y-connected AC regulators. Principles of AC matrix converters, Step-down (Buck) DC choppers, Step-up (Boost) DC choppers, Buck-Boost DC choppers, Design of Buck DC regulators, Design of Boost DC regulators, Design of Buck-Boost DC regulators.

References:

1- M. H. Rashid, Power Electronics: Circuits, Devices, and Applications, 3rd Ed., Prentice Hall, 2004
2- D. W. Hart, Power Electronics, Mc Graw Hill, 2011

ELE415 Automatic Control (2) (2,3,0)

Concept of stability analysis, concept and effect of poles and zeros, frequency response analysis, polar plots, concept of stability in control systems, Routh's stability criterion, Nyquist stability criterion, application of Nyquist stability criterion on Bode plots, root locus method, Lead/lag compensation networks, Review of z-transform, mapping s-plane to z-plane, discrete time control systems and impulse sampling, zero order hold operation and transfer function, constructing original signals from sampled signal. Pulse transfer function od sampled control for open- and closed-loop systems, Transient response, Stability analysis of discrete-time systems, Direct digital control design using root locus, Control design using emulation techniques, State-space description of discrete time systems, Solution of discrete time state equations, Derivation of transfer function from state-space model, Digital implementation of the P, PI, PID controller .

References:

1- Benjamin C. Kuo " Automatic control systems" 9th Edition2010.
2- Katsuhiko Ogata, "Modern Control Engineering", 4th Edition, 2001.

ELE491 Graduation Project (1) (0,0,3)

This course requires the students, working in teams, to take an actual engineering project from the initial proposal stage through the preliminary design phase. Students will conduct the necessary activities and prepare the various documents needed to complete the preliminary design.

References:

ELE448 Computer Applications in High Voltage (1,0,3)

Introduction, Design of Lightning Protection of High Voltage Substation using Computer Application, Study of Conduction and breakdown in gases, liquids and solid dielectrics using Computer Application, Design of Earthing systems using Computer Application, Application of computer and modern automation system for protection and optimum use of High voltage power transformer, Computer Simulation of High-voltage SF6 Circuit Breakers, Study of Overvoltage phenomena in electric power systems using Computer Application.

References:

1- M. Khalifa, " High voltage Engineering- Theory and Practice", Marcel Dekker, Inc., Second Edition, 2000.

ELE492 Graduation Project (2) (0,0,7)

A continuation of ELE491, the design process will continue from the preliminary phase to the completion of a conceptual design of the project. The students, working in teams, will prepare design criteria, calculations, and representative engineering drawings of the project's major components. A list and general description of the many details and other miscellaneous activities required to complete the project will also be prepared.

References:

ELE441 Electrical Distribution Systems (2,1,0)

Distribution systems: Distribution substation service areas, distribution configurations primaries design, secondaries design, Voltage profiles and regulators, O.H.T.L. and equipment, types of power transformers, types of regulators, Underground distribution lines and switchgear: design of distribution Substation, design of service area, Underground distribution lines and switchgear, Capacitors and reactive power compensation, P.F. definitions, methods of improving P.F, Sizing and locating of P.F. VARS, Motor control centers, Distribution substation operation.

References:

1- H. L. Willis, Power distribution planning reference book, CRC press, 2004
2- R. E. Brown, Electric power distribution reliability, CRC press, 2008

ELE442 Power System Planning (2,1,0)

Power System Elements and Structure, Power System Planning Issues, Some Economic Principles, Load Characteristics, Long Term Load Forecasting Methods, Generation Expansion Planning: Definition and Description, Substation Expansion Planning: Definition and Description, Network Expansion Planning: Definition and Description.

References:

1- H. Seifi and M. S. Sepasian, Electric Power System Planning: Issues, Algorithms and Solutions, Springer, 2011.
2- X. Wang, J. McDonald, Modern Power System Planning, McGraw Hill, 1994.

ELE443 Power Quality (2,1,0)

Introduction, Terms and Definitions, Voltage Sags and Interruptions, Transient Overvoltage, Fundamentals of Harmonics, Applied Harmonics, Long-Duration Voltage Variations, Power Quality Benchmarking, Distributed Generation and Power Quality, Wiring and Grounding, Power Quality Monitoring.

References:

1- Alexander Kusko, Power Quality in Electrical Systems, McGraw-Hill Companies, Inc, 2007

ELE444 Electrical Load Forecasting (2,1,0)

Introduction, The roles of forcasting, Simple regression methods, Multiple regression methods, Econometric modeling, Case studies.

References:

1- S.A. Soliman, Electrical Load Forecasting, Butterworth-Heinemann, 2010

ELE445 Modeling and Simulation of Electric Power Systems (2,1,0)

Definition of Modeling and Simulation of Electric Power Systems, Their benefits and applications, Programming using different models of generators and transmission lines, Short circuit calculations, Load flow studies with balanced and unbalanced loads, Stability study of generators connected to infinite bus, Studying the effects of voltage regulators on the voltage and dynamic stability.

References:

1- Devendra K. Chaturvedi, Modeling and Simulation of Systems Using MATLAB and Simulink, Taylor & Francis, 2009

ELE446 Smart Grid (2,1,0)

Smart grid definition, benefits and applications. Smart grid communication network architecture. Advanced Metering Infrastructure (AMI). Pricing and energy consumption scheduling. Electric vehicles and vehicle-to-grid systems. Renewable resources. Microgrid architecture. Fault detection and self-healing systems. Load control switches, Interoperability between power grids, The international perspective (Europe's Super Smart Grid).

References:

1- J. Ekanayake, N. Jenkins, K. Liyanage, J. Wu and A. Yokoyama, Smart Grid Technology and Applications, John Wiley & Sons 2012

ELE447 Control of Power Systems (2,1,0)

Control problems in electrical power system, An introduction to Modeling of turbines and synchronous machine using state space approach– Linearized simulation on model in the s-domain of one machine connected to infinite-bus system, Load Frequency Control (LFC): purpose, modeling of main elements (speed governor, turbine, hydraulic amplifier, valves…) primary and secondary control loop. Dynamic performing of the controlled one machine against infinite-bus system, Excitation control problem: definition and control configuration of classical and modern systems, Transfer function model of excitation system, Excitation system compensation (power system stabilizer), Effect of excitation system on generator, steady–state stability limit and dynamic stabilization, Generation control problem: definitions, and element modeling, Power factor, control of isolated system using PID controller, control of multi area system.

References:

1- P.Kundur, Power System Stability and Control, 1st ed. McGraw-Hill Professional, January 1994

ELE481 Advanced Topics in HV Engineering (2,1,0)

Introduction, Application of High Voltage Engineering to air pollution control, Advanced electrical discharge techniques for cleaning exhausts of thermal power plants and automobiles, Simulation of plasma induced processes, Industrial applications of High Voltage such as Industrial Electrostatic Precipitators, High voltage or current pulse generators and probes for various industrial applications, Development of surge protection devices and pulsed power engineering, Understand the insulation Coordination on power network, Perform the numerical simulation and controlling of transient voltages and currents in electrical circuits.

References:

1- D E.kuffel, W.S. Zaengle and J. Kuffel, “High voltage engineering, Fundamentals”, Newnes, Second edition reprint, 2001.
2- M. Khalifa, “ High voltage Engineering- Theory and Practice”, Marcel Dekker, Inc., Second Edition, 2000.

ELE482 Electrical Safety (2,1,0)

Effect of current on the human body, Fundamentals of ground grid design, Safety aspects of ground grid operation and maintenance, Grounding of distribution systems, effect of high fault currents on protection and metering, Effects of high fault currents on circuit breakers, Effect of high fault currents on transmission lines, Lightning and surge protection.

References:

1- P E. Sutherland, Principles of Electrical Safety, Wiley-IEEE Press, 2015

ELE483 Switchgear and Circuit Breakers (2,1,0)

Introduction, Studying the high voltage bus-bar arrangement, material, clearance and rating, Studying different types of switchgears such as circuit breaker, load break, earthing switch and isolator, Design of air insulated substation, Design of lightning protection of high voltage substation, Design of grounding of high voltage substation, Studying the gas-insulated substation.

References:

1- M. Khalifa, " High voltage Engineering- Theory and Practice", Marcel Dekker, Inc., Second Edition, 2000.

ELE484 Power Systems Protection (2) (2,1,0)

Static/digital versus electromechanical relays, Relaying practices: (Components, detectors and applications), Hardware of digital relay, Digital O.C. relay, Digital distance relay, Digital protection of rotating machines, Digital protection of transformers, Digital bus bar protection, Integration of protection and control in substations, traveling wave based protection, Recent topics in digital protection.

References:

1- P. M. Anderson, Power System Protection, Wiley, Interscience 1999

ELE485 Technology of Electric Power Station (2,1,0)

Thermodynamics Review (1st, 2nd laws of thermodynamics), Steam Formation, Steam Properties and Process, Simple Rankine Cycle, Modified Rankine Cycle, Reheat and Regeneration Cycles, Steam Turbine, Steam Generator and Steam Condenser, Power Plant Control, Simple Gas Turbine Cycle, Gas Turbine Cycle with Reheat, Intercooling and Regeneration, Combined Cycle Power Plant - Nuclear Power Plant - Renewable Power Generation, Solar Energy, Wind Energy, Geothermal Energy.

References:

1- M. El-Wakil, Power Plant Technology, 1st ed. McGraw-Hill, 1984

ELE486 Electrical Power Plants (2,1,0)

Introduction, Energy and electricity fundamentals; Terminology, Electric Energy Economics, Energy Resources, Coal-Fired Power Plant, Environmental impact; Global warming, Gas and steam turbines, tidal and Combined cycle, Nuclear, thermal and hydroelectric power plants, Solar energy principles. Calculation and photovoltaic, Wind power, Geothermal Power Plant, Energy storage.

References:

1- Pansini, AJ 2005, Guide to electric power generation, 3rd edn, Fairmont Press, Lilburn, GA.
2- A course in power plant engineering, Arora Domkundwan , Dhanpat ai & co. LTD 2004

ELE416 Power Electronics (3) (2,1,0)

Modulation techniques of Voltage Source Inverters, Harmonics reduction techniques, Protection of power semiconductor switches, Driving circuits of semiconductor switches, Some power electronics applications.

References:

1- M. H. Rashid, Power Electronics: Circuits, Devices, and Applications, 3rd Ed., Prentice Hall, 2004
2- D. W. Hart, Power Electronics, Mc Graw Hill, 2011

ELE417 Microcontrollers (2,1,0)

Introduction to one of the modern Microcontrollers used in industry, Microcontroller basic structure, Microcontroller basic programming principles (Basic IO design), Timers and Counters, PWM, Analogue interfacing of Microcontrollers, Serial interfacing standards using RS-232 principles, Applications.

References:

1- M. A. Mazidi, S. N. S. Naimi, AVR Microcontroller and Embedded Systems: Using Assembly and C, Pearson Higher Education, 2011

ELE418 Renewable Energy Systems (2,1,0)

Sources of renewable energy, Fundamentals of wind energy, tidal wave energy, solar-thermal energy, geothermal energy, photovoltaic systems, design of a typical photovoltaic inverter battery system, hydro and other common electrical renewable generation schemes, Selection and sizing of systems components, Renewable energy integration with existing grid connected power. Wind Energy Conversion Systems: components, operation, and control.

References:

1- Aldo V. da Rosa, “Fundamentals of Renewable Energy Processes”, 2005, Academic Press.
2- Gilbert M. Masters, “Renewable and Efficient Electric Power Systems”, Wiley- IEEE Press, Barker Library, 2004

ELE419 Industrial Control (2,1,0)

Detecting sensors and actuating elements, Relay logic and their applications, Introduction to PLCs, Types of PLCs and construction, Hardware configuration and descriptions, Programming and testing basic functions, Programming and testing advanced functions, Industrial Applications using PLCs.

References:

1- Siemens Step-7 300 Manuals

UNIVERSITY REQUIREMENTS

GEN0X0 Technical Language (2,0,0)

Characteristics of the English or French or German technical language, grammar review, effective sentences and their characteristics, identify some common mistakes in the writing of technical sentence, paragraph construction, types of paragraphs, development of communication skills by reading and analysis of excerpts from technical writing in various engineering disciplines such as mechanical, electrical , civil ... etc.

References:

1- Mark Hancock & Annie McDonald, English Result - Intermediate Level, Oxford University press, Last Edition .
2- Durrell, Martin, " Using German : a guide to contemporary usage / Martin Durrell", Cambridge, U.K. ; New York : Cambridge University Press, 2003.
3- Coffman Crocker, Mary E, " Schaum's outline of French grammar", McGraw-Hil, Schaum's outline series, 1999, 4th ed.

GEN011 Computer Skills (1,0,1)

IT concepts and terminology, Computer hardware, operating systems, Computer networks, Internet, Computer graphics, Multimedia systems, Databases. Practical applications: Operating system (Microsoft Windows), Word processing (Microsoft Word), Spreadsheets (Microsoft Excel), Microsoft PowerPoint, Databases (Microsoft Access). Introduction to programming concepts, programming languages and their classification, logical design of programs and algorithms, structural programming and object-oriented programming.

References:

1- Practice using ICDL components

GEN012 History of Engineering & Technology (2,0,0)

The definition of science, technology, engineering and architecture. The development of civilizations and their relationship to human sciences (ancient Egyptian civilization, Roman and Greek civilization, Mesopotamia, dark ages, industrial revolution). Different engineering disciplines and their role in society. The historical relationship between science and technology. The relationship between the development of engineering, the social and economic development of the environment, the challenges of globalization and the new economy. The contribution of engineers in the new millennium, the issues of economic and industrial development in Egypt.

References:

1- James E. McClellan & Harold Dorn, Science and Technology in World History: An Introduction, The Johns Hopkins University Press, 2nd. Ed., 2006.
2- Richard Shelton Kirby, Engineering in History, Dover publications, 1990.

GEN900 Communication & Presentation Skills (1,1,0)

General introduction to communication, the importance of communication, types of communication, communication barriers, listening skills, attributes and methods of reading, verbal communication: speaking and writing skills, non-verbal communication, dialogue skills and strategies of persuasion, communication in the work environment, writing CVs, reports and official letters.

References:

1- Gary Johns and Alan M. Saks, Organizational Behavior, Addison Wesley Longman, 2009.
2- Scgermerhorn, Jr., R. J., Hunt, G. J., and Osborn, N. R., Organizational Behavior, John Wiley & Sons, Inc., New York, 10th. Ed., 2008.

GEN901 Theory of Sustainability (1,1,0)

The course aims to introduce students to the concept of sustainability and its feasibility in order to develop its capabilities to reach architectural applications that contribute to achieving the goals of sustainability and its usefulness and to clarify the risks of unsustainable environment. The course deals with the components of the natural environment and the factors of preserving its components and equilibrium, the biological system, cycles and ecological chains, the presence characteristics of natural resources, energy and biological systems. Rapid development of sustainability applications and their comprehensiveness based on modern means of communication and digital technologies.

References:

1- Perspectives for a New Social Theory of Sustainability, Mariella Nocenzi and Alessandra Sannella, Springer Nature Switzerland 2020 .

GEN902 Human Rights and Combating Corruption (1,1,0)

Human rights: general introduction, definition of human rights, characteristics and principles of human rights, general rules of the idea of human rights, historical development of the idea of human rights, types of human rights, individual rights, collective rights (people's rights), sources of human rights, legal system of rules of protection Human rights, human rights according to the Egyptian constitution in 2014, the duties and obligations of individuals in society. Combating corruption: definition of corruption, its causes, effects and characteristics, types of corruption and its causes, the impact of corruption on human rights and development, the impact of corruption on economic rights and sustainable development, criminal confrontation of corruption.

References:

1- Peter Joseph , The New Human Rights Movement: Reinventing the Economy to End Oppression, Inc. Blackstone Audio: Books, 2017

GEN903 Research and Analysis Skills (1,1,0)

Scientific thinking and its characteristics, definition of scientific research and its characteristics, steps of scientific research (selection of the subject of research, determine the problem of research and selection factors, determine the framework of research, determine the method of research, data analysis), types of scientific studies: exploratory studies, descriptive studies, experimental studies . Methods of scientific research: descriptive approach, social survey, content study, content analysis. Data collection tools: Metrics, observation, interview, questionnaire. Data presentation and analysis methods: Descriptive methods, deductive methods.

References:

1- Gary Johns and Alan M. Saks, Organizational Behavior, Addison Wesley Longman, 2009.
2- Scgermerhorn, Jr., R. J., Hunt, G. J., and Osborn, N. R., Organizational Behavior, John Wiley & Sons, Inc., New York, 10th. Ed., 2008.

GEN904 Entrepreneurship (1,1,0)

Concepts in Entrepreneurship, Entrepreneurship and Small Enterprises, Generating Ideas for Entrepreneurial Projects, University and Entrepreneurship Opportunities and Challenges, Marketing Plan, Operational Plan, Financial Plan, Business Plan Writing, Technological Environment of Entrepreneurship, External Business Environment of Entrepreneurial Projects, Support Programs for Leading Projects Egyptian Economy, Entrepreneurial Project Presentation Skills.

References:

1- Entrepreneurship: An Evidence-Based Guide by Robert A Baron Edward Elgar Pub., 2012.

GEN905 Professional Ethics (1,1,0)

The course provides the background needed to discuss the core topics of engineering ethics, with a focus on the ethical issues facing engineers in the areas of engineering work in companies. The course includes the definition of the general elements of the ethics of the profession and the observance of the public interest and regulations and regulations,

obligations to the community, the responsibilities of engineers, disclosure of violations, behavior, basic principles and codes of the ABET code of conduct of engineers.

References:

1- William Frey, Professinnal Ethics in Engineering, November, 2013, http://cnx.org/content/col10399/1.4/

GEN906 Critical Thinking (1,1,0)

Theoretical concepts (memory, thinking, creativity), an introduction to the thinking skills, the nature of thinking (definition, characteristics, levels), types of thinking (creative, critical, scientific), cognitive thinking skills, meta-cognitive thinking skills, thinking measurement tools, strategies Used in the development of thinking skills, programs to teach thinking skills, methods of teaching thinking skills.

References:

1- Critical Thinking: A Beginner's Guide to Critical Thinking, Better Decision Making and Problem Solving Paperback, by Jennifer Wilson,, Create Space Independent Publishing Platform 2017.

GEN907 Human Resources Management (1,1,0)

Historical development of human resources management, key functions of human resources management, human resources planning, access to human resources, training and development of human resources, compensation of human resources, human resource conservation.

References:

1- Human Resource Management, University of Minnesota Libraries Publishing, 2016

GEN908 Contracts and Legislation (1,1,0)

The course aims to provide the student with the technical and legislative knowledge related to the practice of the profession. The study of building legislation, urban planning and the laws governing the practice of the profession and the work systems (engineer / owner / contractor / ...) at the local and international levels as well as studying the methods of contracting/rules and systems for the preparation of integrated implementation documents. Tenders and methods of their examination and evaluation.

References:

1- Randall S. Schuler, Susan E. Jackson, Strategic Human Resoure Management , Wiley, 2nd ed., 2007.
2- Lewicki, J. R., Saunders, M. D., and Barry, B., Essentials of Negotiation, McGraw - Hill, 5th. Ed., 2011.

GEN909 Method of Scientific Research and Writing (1,1,0)

The course aims to develop the student's abilities to conduct applied scientific research in one of the fields presented for the graduation project and train to work within a research team, while following the steps of sound scientific research to draw conclusions. The elements and components of scientific research: research problem, scientific method to solve problems and fundamental differences between different scientific research methods, methods of collecting data and statistics necessary for research, methods of examination and analysis of data and information and scientific dealing with variables, formulation of research hypotheses, methods of discussion and examination of hypotheses, drawing conclusions. Scientific method of writing a scientific research (thesis writing). The students select one of the problems in the architectural, urban or any technical field, previously presented as the basis for the graduation project, to conduct the necessary scientific research. Finally, the student is discussed orally through a committee to evaluate the student's performance, within his group, and his findings, studies, analyzes, conclusions and recommendations for the graduation project thesis.

References:

1- Research Methodology and Scientific Writing, by C. George Thomas, Ane Books Pvt. Ltd., 2016

COMMUNICATIONS AND ELECTRONICS ENGINEERING PROGRAM

Program Information

1. **Faculty vision:**

   The faculty of Engineering at Shoubra, Benha University, aspires to be a pioneering college at the national, regional and international levels in the fields of engineering education, scientific research, innovation and entrepreneurship in order to achieve the goals of sustainable development.

2. **Faculty Mission**

   The faculty of Engineering at Shoubra is committed to prepare a graduate with competencies and problem-solving skills[1] that qualify each engineer to compete in local and regional labor markets[2], the graduate will be able to innovate and become an entrepreneur[3], the faculty is also committed to the development of engineering sciences[4] and producing internationally distinguished scientific research[5], within the framework of human values and social responsibility[6].

3. **Program Vision**

   The communications and electronics engineering program, faculty of Engineering at Shoubra, aspires to be a pioneering program in education and scientific research in the fields of communications and electronics engineering at the regional and international levels and to provide an outstanding community service to the community and the surrounding environment.

4. **Program Mission**

   The program is committed to preparing a distinguished graduate who possesses the knowledge and skills that qualify him to compete in the labor market, locally and regionally, and to provide international scientific research in the fields of communication and electronics engineering, and to help him innovate and participate effectively in community development while applying professional ethical standards

   The program is committed to preparing a distinguished graduate who possesses the knowledge and skills [1] that qualify him to compete in the labor market, locally and regionally [2], and to provide international scientific research [3] in the fields of communications and electronics engineering, and to help him innovate [4], and participate effectively in community development [5] while applying professional ethical standards [6].

To judge the compatibility between the program mission and faculty mission, the following matrix is used.

Key Words of Faculty Mission / Key Words of Program Mission	prepare a graduate with competencies and problem-solving skills [1]	compete in local and regional labor markets [2]	innovate and become an entrepreneur [3]	development of engineering sciences [4]	producing internationally distinguished scientific research [5]	human values and social responsibility [6].
Preparing an outstanding graduate possesses the knowledge and skills [1]	√	√				
Compete in the labor market [2]	√	√				
international scientific research [3]				√	√	
innovation [4]			√			√
participation in community development [5]		√	√			√
applying professional ethical standards [6]						√

5. Program aims

The communications and electronics engineering program aims to:

1. Preparing a graduate who is able to effectively deal with the era requirements and the use of modern technological means.
2. Graduating engineers with effective communication and teamwork skills in various projects and cooperation with all engineering disciplines.
3. Graduate engineers who have the ability to develop professional performance, creative thinking and entrepreneurship, based on community values and professional ethics.
4. Preparing a graduate who is able to integrate the application of knowledge of mathematics, engineering sciences and self-learning skills in addition to innovation to provide a solution to natural problems and produce distinguished scientific research.
5. Preparing a graduate who is able to analyze and design electronic circuits and discover errors and fix them using electronic devices.
6. Preparing a graduate who is able to create new digital and analog communication systems, as well as mobile communications according to high technical specifications.

To judge the compatibility of program mission with its objectives, the following matrix is used:

Key Words of Program Mission / **Program Objectives**	Preparing an outstanding graduate possesses the skills and knowledge [1]	Compete in the labor market [2]	international scientific research [3]	Innovation [4]	participation in community development [5]	applying professional ethical standards [6]
Objective #1	√	√		√	√	
Objective #2		√			√	
Objective #3	√			√	√	√
Objective #4	√		√	√		
Objective #5	√	√			√	
Objective #6	√	√			√	

6. Graduate Attributes

1. Master a wide spectrum of engineering knowledge and specialized skills and can apply acquired knowledge using theories and abstract thinking in real life situations;
2. Apply analytic critical and systemic thinking to identify, diagnose and solve engineering problems with a wide range of complexity and variation;
3. Behave professionally and adhere to engineering ethics and standards;
4. Work in and lead a heterogeneous team of professionals from different engineering specialties and assume responsibility for own and team performance;
5. Recognize his/her role in promoting the engineering field and contribute in the development of the profession and the community;
6. Value the importance of the environment, both physical and natural, and work to promote sustainability principles;
7. Use techniques, skills and modern engineering tools necessary for engineering practice;
8. Assume full responsibility for own learning and self-development, engage in lifelong learning and demonstrate the capacity to engage in post- graduate and research studies;
9. Communicate effectively using different modes, tools and languages with various audiences; to deal with academic/professional challenges in a critical and creative manner;

10. Demonstrate leadership qualities, business administration and entrepreneurial skills.
11. Professional integration of knowledge, engineering understanding and feedback to improve product and service design.
12. Create and re-design a component or system process and implement specialized engineering designs
13. Using laboratories and equipment efficiently and safely, monitoring, recording and analyzing data in the lab.
14. Use measurement tools, workshops, and laboratory equipment to design experiments to collect, analyze and interpret results
15. Use the advanced engineering tools for digital and analog communication systems, mobile communication, coding and decoding systems, Optical communication systems, antenna and microwave applications
16. Preparing and displaying technical reports.

7. Program Competencies

According to the National Academic Reference Standard, the program in communications and electronics engineering must satisfy the following Competencies:

1- General Engineering NARS Competencies in 2018		
Level A (NARS)	A.1	Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.
	A.2	Develop and conduct appropriate experimentation and/or simulation, analyze and interpret data, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.
	A.3	Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the discipline and within the principles and contexts of sustainable design and development.
	A.4	Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.
	A.5	Practice research techniques and methods of investigation as an inherent part of learning.
	A.6	Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.
	A.7	Function efficiently as an individual and as a member of multi-disciplinary and multi- cultural teams.
	A.8	Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.
	A.9	Use creative, innovative and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.
	A.10	Acquire and apply new knowledge; and practice self, lifelong and other learning strategies.

2- Electrical NARS Competencies in 2018		
Level B (NARS)	B.1	Select, model and analyze electrical power systems applicable to the specific discipline by applying the concepts of: generation, transmission and distribution of electrical power systems.
	B.2	Design, model and analyze an electrical/electronic/digital system or component for a specific application; and identify the tools required to optimize this design.
	B.3	Design and implement: elements, modules, sub-systems or systems in electrical/electronic/digital engineering using technological and professional tools.
	B.4	Estimate and measure the performance of an electrical/electronic/digital system and circuit under specific input excitation, and evaluate its suitability for a specific application.
	B.5	Adopt suitable national and international standards and codes to: design, build, operate, inspect and maintain electrical/electronic/digital equipment, systems and services.
3- Communications and Electronics ARS		
Level C (ARS)	C.1	Design and implement the performance of digital and analog communication, mobile communication, coding, and decoding systems
	C.2	Depict, and analyze the performance of antenna and microwave applications
	C.3	Realize and examine the performance of Optical communication systems
	C.4	Resolve imbedded systems and analyze signal processing
	C.5	Synthesis and integrate electronic systems for certain specific function using the right equipment

To judge the compatibility of program objectives with its competencies, the following matrix is used:

Program Objectives		Program Competencies																		
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	C1	C2	C3	C4	C5
Objective #1	√		√							√		√	√			√				√
Objective #2	√				√	√					√	√								
Objective #3			√			√			√		√		√	√						
Objective #4	√				√									√	√	√	√	√	√	√
Objective #5		√		√					√			√		√						√
Objective #6		√	√							√	√	√				√	√	√	√	

PROGRAM REQUIREMENTS

Communications and Electronics Engineering Program Requirements

#	Requirements	Contact Hours	%	% according to reference framework
1	Humanities & Social Sciences	20	8	8-12
2	Mathematics & Basic Sciences	65	26	25-30
3	Basic Engineering Subjects	73	29	25-30
4	Applied Engineering and Design	67	27	25-30
5	Business Administration	8	3	2-4
6	Engineering Knowledge	9	4	3-6
7	Projects & Training	8	3	3-6
		250	100	100

#	Subjects	Contact Hours	%	Min. Percentage according to reference framework (%)
1	University Requirements	20	8	8
2	Faculty Requirements	70	28	20
3	Major Specialization Subjects	93	37	35
4	Minor Specialization Subjects	67	27	Maximum 30
		250	100	

LIST OF COURSES

COMMUNICATIONS & ELECTRONICS ENGINEERING PROGRAM

No.	Code	Course	Contact Hrs				Credit Hours
			Lec.	Tut.	Lab.	Total	Total
University Requirements (12+7+1=20 Contact Hours)= (12 Credit Hours)							
1	GEN0x0	Elective - Language requirements List	2	0	0	2	2
2	GEN011	Computer Skills	1	0	1	2	1
3	GEN012	History of Engineering & Technology	2	0	0	2	2
4	GEN9xx	Elective - University Requirements list	1	1	0	2	1
5	GEN9xx	Elective - University Requirements list	1	1	0	2	1
6	GEN9xx	Elective - University Requirements list	1	1	0	2	1
7	GEN9xx	Elective - University Requirements list	1	1	0	2	1
8	GEN9xx	Elective - University Requirements list	1	1	0	2	1
9	GEN9xx	Elective - University Requirements list	1	1	0	2	1
10	GEN9xx	Elective - University Requirements list	1	1	0	2	1
Faculty Requirements (25+ 23+22 =70 Contact Hours)= (43 Credit Hours)							
1	BAS010	Differential Calculus and Algebra	2	2	0	4	3
2	BAS011	Statics	2	1	2	5	3
3	BAS012	Engineering Chemistry	2	1	2	5	3
4	BAS013	Physics of Materials & Electricity	2	1	3	6	3
5	MEC010	Engineering Drawing (1)	0	3	0	3	1
5	MEC012	Engineering Drawing (2)	0	3	1	4	2
6	BAS014	Integral Calculus & Analytical Geometry	2	2	0	4	3
7	BAS015	Dynamics	2	1	2	5	3
8	BAS016	Physics of Light, Heat and Magnetism	2	1	2	5	3
9	MEC011	Principles of Manufacturing Engineering	1	0	2	3	2
10	BAS112	Differential Equations	2	2	0	4	3
11	BAS113	Special Functions and Transformations	2	2	0	4	3
12	ELE123	Technical Reports	2	0	0	2	2
13	BAS212	Partial Differential Equations and Numerical Analysis	2	2	0	4	3
14	BAS213	Statistics and Probability	2	2	0	4	3
15	ELE491	Graduation Project (1)	0	0	3	3	1
15	ELE492	Graduation Project (2)	0	0	5	5	2
00	ELE100	Summer Training (1)	0	0	0	0	0
00	ELE 200	Summer Training (2)	0	0	0	0	0
00	ELE300	Industrial Training (1)	0	0	0	0	0
00	ELE400	Industrial Training (2)	0	0	0	0	0
Major Specialization Subjects (40+27+26=93 Contact Hours) = (60 Credit Hours)							

1	ELE126	Mechanical and Civil Engineering	2	2	0	4	3
2	ELE125	Management of Engineering Projects	2	1	1	4	3
3	ELE121	Electrical Circuits	2	2	1	5	3
4	ELE122	Physics of Semiconductors	2	2	1	5	3
5	ELE124	Electronics (1)	2	2	1	5	3
6	ELE131	Computer Programming (1)	2	0	3	5	3
7	ELE132	Computer Programming (2)	2	0	3	5	3
8	ELE133	Design of Logic Circuits	2	2	1	5	3
9	ELE218	Engineering Economics	2	2	0	4	3
10	ELE241	Electrical Power Engineering	2	2	0	4	3
11	ELE221	Electronic Measurements	2	2	1	5	3
12	ELE222	Electrical and Magnetic Fields	2	2	1	5	3
13	ELE224	Signal Analysis and Systems	2	2	1	5	3
14	ELE225	Electronics (2)	2	2	1	5	3
15	ELE231	Web Programming	2	0	3	5	3
16	ELE232	Computer Organization	2	2	1	5	3
17	ELE321	Communication Systems	2	0	3	5	3
18	ELE324	Digital Signal Processing	2	0	2	4	3
19	ELE334	Embedded Systems	2	0	2	4	3
20	ELE343	Electrical Machines and Control	2	2	0	4	3
Minor Specialization Subjects (28+0+39=67 Contact Hours) = (42 Credit Hours)							
1	ELE322	Computer Networks	2	0	3	5	3
2	ELE323	Electromagnetic Waves	2	0	3	5	3
3	ELE325	Digital and Wireless Communications	2	0	3	5	3
4	ELE327	Microwave Engineering	2	0	3	5	3
5	ELE328	Electronic Circuits	2	0	3	5	3
6	ELE328	Information Security	2	0	2	4	3
7	ELE421	Mobile Communications	2	0	3	5	3
8	ELE422	Antenna and Wave Propagation	2	0	3	5	3
9	ELE423	Industrial Electronics	2	0	2	4	3
10	ELE424	Optical Communications	2	0	2	4	3
11	ELE4XX	Elective Course (1)	2	0	3	5	3
12	ELE4XX	Elective Course (2)	2	0	3	5	3
13	ELE4XX	Elective Course (3)	2	0	3	5	3
14	ELE4XX	Elective Course (4)	2	0	3	5	3

COURSES CLASSIFICATION
COMMUNICATIONS & ELECTRONICS ENGINEERING PROGRAM

No.	Code	Course	Contact Hrs			
			Lec.	Tut.	Lab.	Total
Humanities & Social Science Subjects (20 Contact Hours)						
1	GEN0x0	Elective - Language requirements List	2	0	0	2
2	GEN011	Computer Skills	1	0	1	2
3	GEN012	History of Engineering & Technology	2	0	0	2
4	GEN9xx	Elective - University Requirements list	1	1	0	2
5	GEN9xx	Elective - University Requirements list	1	1	0	2
6	GEN9xx	Elective - University Requirements list	1	1	0	2
7	GEN9xx	Elective - University Requirements list	1	1	0	2
8	GEN9xx	Elective - University Requirements list	1	1	0	2
9	GEN9xx	Elective - University Requirements list	1	1	0	2
10	GEN9xx	Elective - University Requirements list	1	1	0	2
Business Administration (8 Contact Hours)						
1	ELE125	Management of Engineering Projects	2	1	1	4
2	ELE218	Engineering Economics	2	2	0	4
Mathematics & Basic Sciences (65 Contact Hours)						
1	BAS010	Differential Calculus and Algebra	2	2	0	4
2	BAS011	Statics	2	1	2	5
3	BAS012	Engineering Chemistry	2	1	2	5
4	BAS013	Physics of Materials & Electricity	2	1	3	6
5	BAS014	Integral Calculus & Analytical Geometry	2	2	0	4
6	BAS015	Dynamics	2	1	2	5
7	BAS016	Physics of Light, Heat and Magnetism	2	1	2	5
8	BAS112	Differential Equations	2	2	0	4
9	BAS212	Partial Differential Equations and Numerical Analysis	2	2	0	4
10	BAS213	Statistics and Probability	2	2	0	4
11	BAS113	Special Functions and Transformations	2	2	0	4
12	ELE122	Physics of Semiconductors	2	2	1	5
13	ELE222	Electrical and Magnetic Fields	2	2	1	5
14	ELE323	Electromagnetic Waves	2	0	3	5
Engineering Knowledge Subjects (9 Contact Hours)						
1	MEC011	Principles of Manufacturing Engineering	1	0	2	3
2	ELE126	Mechanical and Civil Engineering	2	2	0	4
3	ELE123	Technical Reports	2	0	0	2
Basic Engineering Science Subjects (73 Contact Hours)						
1	MEC010	Engineering Drawing (1)	0	3	0	3
2	MEC012	Engineering Drawing (2)	0	3	1	4
3	ELE121	Electrical Circuits	2	2	1	5
4	ELE124	Electronics (1)	2	2	1	5
5	ELE131	Computer Programming (1)	2	0	3	5
6	ELE132	Computer Programming (2)	2	0	3	5
7	ELE221	Electronic Measurements	2	2	1	5

8	ELE224	Signal Analysis and Systems	2	2	1	5
9	ELE225	Electronics (2)	2	2	1	5
10	ELE231	Web Programming	2	0	3	5
11	ELE232	Computer Organization	2	2	1	5
12	ELE241	Electrical Power Engineering	2	2	0	4
13	ELE321	Communication Systems	2	0	3	5
14	ELE324	Digital Signal Processing	2	0	2	4
15	ELE334	Embedded Systems	2	0	2	4
16	ELE343	Electrical Machines and Control	2	2	0	4
Applied Engineering and Design Subjects (67 Contact Hours)						
1	ELE133	Design of Logic Circuits	2	2	1	5
2	ELE328	Electronic Circuits	2	0	3	5
3	ELE327	Microwave Engineering	2	0	3	5
4	ELE322	Computer Networks	2	0	3	5
5	ELE325	Digital and Wireless Communications	2	0	3	5
6	ELE338	Information Security	2	0	2	4
7	ELE421	Mobile Communications	2	0	3	5
8	ELE422	Antenna and Wave Propagation	2	0	3	5
9	ELE423	Industrial Electronics	2	0	2	4
10	ELE424	Optical Communications	2	0	2	4
11	ELE4XX	Elective Course (1)	2	0	3	5
12	ELE4XX	Elective Course (2)	2	0	3	5
13	ELE4XX	Elective Course (3)	2	0	3	5
14	ELE4XX	Elective Course (4)	2	0	3	5
Projects and Field Training Subjects (8 Contact Hours)						
1	ELE491	Graduation Project (1)	0	0	3	3
2	ELE492	Graduation Project (2)	0	0	5	5
3	ELE100	Summer Training (1)	0	0	0	0
4	ELE 200	Summer Training (2)	0	0	0	0
5	ELE 300	Field Training (1)	0	0	0	0
6	ELE 400	Field Training (2)	0	0	0	0

STUDY PLANS

PREPARATORY YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
BAS010	Differential Calculus and Algebra	2	2	0	4	60	0	60	120	3
BAS011	Statics	2	1	2	5	45	30	75	150	3
BAS012	Engineering Chemistry	2	1	2	5	45	30	75	150	3
BAS013	Physics of Materials & Electricity	2	1	3	6	45	45	90	180	3
MEC010	Engineering Drawing (1) ×	0	3	0	3	25	20	45	90	3
GEN0x0	Elective - Language requirements List	2	0	0	2	30	0	30	60	2
		10	**8**	**7**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
BAS014	Integral Calculus & Analytical Geometry	2	2	0	4	60	0	60	120	3
BAS015	Dynamics	2	1	2	5	45	30	75	150	3
BAS016	Physics of Light, Heat and Magnetism	2	1	2	5	45	30	75	150	3
MEC011	Principles of Manufacturing Engineering†	1	0	2	3	25	20	45	90	3
MEC012	Engineering Drawing (2) ×	0	3	1	4	30	30	60	120	3
GEN011	Computer Skills ×	1	0	1	2	15	15	30	60	2
GEN012	History of Engineering & Technology	2	0	0	2	30	0	30	60	2
		10	**7**	**8**	**25**				**750**	

† In workshops, students are divided into groups 15 students/each, and a faculty stuff member (or an assistant) as well as a practical trainer will teach the group.

× In exercises, students are divided into groups 15 students/each. Two faculty stuff members or their assistants will teach each group.

FIRST YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
BAS112	Differential Equations	2	2	0	4	60	0	60	120	3
ELE121	Electrical Circuits *	2	2	1	5	50	25	75	150	3
ELE122	Physics of Semiconductors	2	2	1	5	50	25	75	150	3
ELE131	Computer Programming (1)	2	0	3	5	50	25	75	150	3
ELE126	Mechanical and Civil Engineering	2	2	0	4	30	30	60	120	3
ELE123	Technical Reports	2	0	0	2	30	0	30	60	2
		12	**8**	**5**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
BAS113	Special Functions and Transformations	2	2	0	4	60	0	60	120	3
ELE124	Electronics (1)	2	2	1	5	50	25	75	150	3
ELE125	Management of Engineering Projects	2	1	1	4	30	30	60	120	2
ELE132	Computer Programming (2)	2	0	3	5	50	25	75	150	3
ELE133	Design of Logic Circuits	2	2	1	5	50	25	75	150	3
GEN9xx	Elective - University Requirements list	1	1	0	2	20	10	30	60	2
		11	**8**	**6**	**25**				**750**	

* Prior to registering in first year, the student should have completed 3 weeks of summer training (1) (ELE100) for 3 weeks in summer, 5 days per week. The daily training is for 5 hours (2 hrs Lecture + 3 hrs tutorial), amounting to a total of 25 hours per week. A maximum grade of 25 marks is added to the 'semester work' grades of the "electrical circuits" course (ELE121).

SECOND YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
BAS212	Partial Differential Eqs. & Numerical Analysis	2	2	0	4	60	0	60	120	3
ELE221	Electronic Measurements *	2	2	1	5	50	25	75	150	3
ELE222	Electrical and Magnetic Fields	2	2	1	5	50	25	75	150	3
ELE231	Web Programming	2	0	3	5	50	25	75	150	3
ELE241	Electrical Power Engineering	2	2	0	4	30	30	60	120	3
GEN9xx	Elective - University Requirements list	1	1	0	2	20	10	30	60	2
		11	**9**	**5**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
BAS213	Statistics and Probability	2	2	0	4	60	0	60	120	3
ELE218	Engineering Economics	2	2	0	4	60	0	60	120	2
ELE224	Signal Analysis and Systems	2	2	1	5	50	25	75	150	3
ELE225	Electronics (2)	2	2	1	5	50	25	75	150	3
ELE232	Computer Organization	2	2	1	5	50	25	75	150	3
GEN9xx	Elective - University Requirements list	1	1	0	2	20	10	30	50	2
		11	**11**	**3**	**25**				**750**	

* After completing the first year, the student should have completed 3 weeks of summer training (2) (ELE200) for 3 weeks in summer, 5 days per week. The daily training is for 5 hours (2 hrs Lecture + 3 hrs tutorial), amounting to a total of 25 hours per week. A maximum grade of 25 marks is added to the 'semester work' grades of the “Electronic Measurements” course (ELE221).

THIRD YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
ELE321	Communication Systems	2	0	3	5	40	25	60	125	3
ELE322	Computer Networks	2	0	3	5	30	30	60	120	3
ELE323	Electromagnetic Waves	2	0	3	5	40	25	60	125	3
ELE334	Embedded Systems	2	0	2	4	30	30	60	120	3
ELE343	Electrical Machines and Control	2	2	0	4	30	30	60	120	3
GEN9xx	Elective - University Requirements list	1	1	0	2	20	10	30	60	2
ELE300	Field Training (1) *	0	0	0	0	15	15	0	30	0
		11	3	11	25				750	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
ELE324	Digital Signal Processing	2	0	2	4	30	30	60	120	3
ELE325	Digital and Wireless Communications	2	0	3	5	50	25	75	150	3
ELE338	Information Security	2	0	2	4	30	30	60	120	3
ELE327	Microwave Engineering	2	0	3	5	50	25	75	150	3
ELE328	Electronic Circuits	2	0	3	5	50	25	75	150	3
GEN9xx	Elective - University Requirements list	1	1	0	2	20	10	30	60	2
		11	1	13	25				750	

* After completing the second year, the student undergoes field training (1) (ELE300) for 4 weeks during the summer vacation, in a factory, company, firm or project site …etc in a related field. Every 5 students are supervised by a staff member of the department, (this supervision is not included in the staff member's teaching load).

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FOURTH YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
ELE421	Mobile Communications	2	0	3	5	30	30	60	120	3
ELE422	Antenna and Wave Propagation	2	0	3	5	50	25	75	150	3
ELE4XX	Elective Course (1)	2	0	3	5	50	25	75	150	3
ELE4XX	Elective Course (2)	2	0	3	5	50	25	75	150	3
GEN9xx	Elective - University Requirements list	1	1	0	2	20	10	30	60	2
ELE491	Graduation Project (1)	0	0	3	3	50	40	0	90	-
ELE 400	Field Training (2) *	0	0	0	0	15	15	0	30	0
		9	**1**	**15**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
ELE423	Industrial Electronics	2	0	2	4	30	30	60	120	3
ELE424	Optical Communications	2	0	2	4	30	30	60	120	3
ELE4XX	Elective Course (3)	2	0	3	5	50	25	75	150	3
ELE4XX	Elective Course (4)	2	0	3	5	50	25	75	150	3
GEN9xx	Elective - University Requirements list	1	1	0	2	20	10	30	60	2
ELE492	Graduation Project (2) **	0	0	5	5	30	120	0	150	-
		9	**1**	**15**	**25**				**750**	

* After completing the third year, the student undergoes field training (2) (ELE400) for 4 weeks during the summer vacation, in a factory, company, firm or project site …etc in a related field. Every 5 students are supervised by a staff member of the department, (this supervision is not included in the staff member's teaching load).

** After completing the second semester, the students are divided into groups and continue performing the graduation project for 4 weeks.

LIST OF TECHNICAL LANGUAGES ELECTIVE COURSES

#	Code	Contact Hours	Contact Hrs			
			Lec.	Tut.	Lab.	Total
1	GEN010	English Language	2	0	0	2
2	GEN020	German Language	2	0	0	2
3	GEN030	French Language	2	0	0	2

LIST OF UNIVERSITY REQUIREMENTS ELECTIVE COURSES

#	Code	Contact Hours	Contact Hrs			
			Lec.	Tut.	Lab.	Total
1	GEN900	Communication & Presentation Skills	1	1	0	2
2	GEN901	Theory of Sustainability	1	1	0	2
3	GEN902	Human Rights and Combating Corruption	1	1	0	2
4	GEN903	Research & Analysis Skills	1	1	0	2
5	GEN904	Entrepreneurship	1	1	0	2
6	GEN905	Professional Ethics	1	1	0	2
7	GEN906	Critical Thinking	1	1	0	2
8	GEN907	Human Resources Management	1	1	0	2
9	GEN908	Contracts and Legislation	1	1	0	2
10	GEN909	Method of Scientific Research and Writing	1	1	0	2

LIST OF ELECTIVE COURSES FOR

COMMUNICATIONS AND ELECTRONICS ENGINEERING

#	Code	Contact Hours	Contact Hrs			
			Lec.	Tut.	Lab.	Total
1	ELE425	Satellite Communications	2	0	3	5
2	ELE426	Rader Systems	2	0	3	5
3	ELE427	Advanced Networks	2	0	3	5
4	ELE428	Acoustic Engineering	2	0	3	5
5	ELE429	Information Theory	2	0	3	5
6	ELE451	Design of Very Large-Scale Circuits	2	0	3	5
7	ELE452	Visible Light Communications	2	0	3	5
8	ELE453	Robotics Systems	2	0	3	5
9	ELE454	Microcontrollers Systems	2	0	3	5
10	ELE455	Adaptive Signal Processing	2	0	3	5
11	ELE456	Selected Topics in Advanced Electronics	2	0	3	5
12	ELE457	Selected Topics in Advanced Communications	2	0	3	5

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COMMUNICATIONS AND ELECTRONICS ENGINEERING TREE

	First Semester						Second Semester					
Elective Courses	ELE425 **Satellite Communications**	ELE426 **Rader Systems**	ELE427 **Advanced Networks**	ELE428 **Acoustic Engineering**	ELE429 **Information Theory**	ELE451 **Design of Very Large-Scale Circuits**	ELE452 **Visible Light Communications**	ELE453 **Robotics Systems**	ELE454 **Microcontrollers Systems**	ELE455 **Adaptive Signal Processing**	ELE456 **Selected Topics in Advanced Electronics**	ELE457 **Selected Topics in Advanced Communications**
Prerequisite	ELE321 **Communication Systems**	ELE321 **Communication Systems**	ELE322 **Computer Networks**	ELE328 **Electronic Circuits**	ELE224 **Signal Analysis and Systems**	ELE328 **Electronic Circuits**	ELE321 **Communication Systems**		ELE334 **Embedded Systems**	ELE324 **Digital Signal Processing**		

FOURTH YEAR	ELE421 **Mobile Communications**	ELE422 **Antenna and Wave Propagation**	ELE4XX **Elective Course (1)**	ELE4XX **Elective Course (2)**	GEN9XX **Univ. Req. Elective**	ELE491 **Project (1)**	ELE423 **Industrial Electronics**	ELE424 **Optical Communications**	ELE4XX **Elective Course (3)**	ELE4XX **Elective Course (4)**	GEN9XX **Univ. Req. Elective**	ELE492 **Project (2) ***
Prerequisite	ELE321 **Communication Systems**	ELE323 **Electromagnetic Waves**					ELE328 **Electronic Circuits**	ELE321 **Communication Systems**				

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THIRD YEAR	ELE321 Communication Systems	ELE322 Computer Networks	ELE323 Electromagnetic Waves	ELE334 Embedded Systems	ELE343 Electrical Machines and Control	GEN9XX Univ. Req. Elective	ELE300 Field Training (2)	ELE324 Digital Signal Processing	ELE325 Digital and Wireless Communications	ELE338 Information Security	ELE327 Microwave Engineering	ELE328 Electronic Circuits	GEN9XX Univ. Req. Elective
Prerequisite	ELE224 Signal Analysis and Systems	ELE133 Design of Logic Circuits	ELE222 Electrical and Magnetic Fields	ELE232 Computer Organization	ELE222 Electrical and Magnetic Fields			ELE224 Signal Analysis and Systems	ELE321 Communication Systems	ELE322 Computer Networks	ELE334 Embedded Systems	ELE225 Electronics (2)	

SECOND YEAR	ELE221 Electronic Measurements	ELE222 Electrical and Magnetic Fields	ELE231 Web Programming	ELE241 Electrical Power Engineering	BAS212 Partial Differential Eqs. & Numerical Analysis	GEN9XX Univ. Req. Elective	ELE200 Field Training (1)	ELE224 Signal Analysis and Systems	ELE232 Computer Organization	ELE225 Electronics (2)	BAS213 Statistics and Probability	ELE226 Engineering Economics	GEN9XX Univ. Req. Elective
Prerequisite	ELE124 Electronics (1)	BAS 016 Physics of Light, Heat and Magnetism	ELE132 Computer Programming (2)	ELE121 Electrical Circuits	BAS112 Differential Equations			BAS113 Special Functions and Transformations	ELE133 Design of Logic Circuits	ELE124 Electronics (1)	BAS 014 Integral Calculus & Analytical Geometry		

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FIRST YEAR	BAS112 **Differential Equations**	ELE126 **Mechanical and Civil Engineering**	ELE121 **Electrical Circuits**	ELE131 **Computer Programming (1)**	**ELE122** **Physics of Semiconductors**	ELE123 **Technical Reports**	BAS113 **Special Functions and Transformations**	ELE132 **Computer Programming (2)**	ELE124 **Electronics (1)**	ELE125 **Management of Engineering Projects**	ELE133 **Design of Logic Circuits**	GEN9XX **Univ. Req. Elective**
Prerequisite	BAS 014 **Integral Calculus & Analytical Geometry**		BAS013 **Physics of Materials & Electricity**	GEN011 **Computer Skills**	BAS013 **Physics of Materials & Electricity**		BAS112 **Differential Equations**	GEN011 **Computer Skills**	**ELE122** **Physics of Semiconductors**		GEN011 **Computer Skills**	

Prep. YEAR	BAS010 **Differential Calculus and Algebra**	BAS011 **Statics**	BAS012 **Engineering Chemistry**	BAS013 **Physics of Materials & Electricity**	MEC010 **Engineering Drawing (1)**	GEN0X0 **Technical Language Elective**	BAS 014 **Integral Calculus & Analytical Geometry**	BAS 015 **Dynamics**	BAS 016 **Physics of Light, Heat and Magnetism**	MEC011 **Principles of Manufacturing Engineering**	MEC012 **Engineering Drawing (2)**	GEN011 **Computer Skills**	GEN112 **History of Engineering & Technology**
Prerequisite							BAS010 **Differential Calculus and Algebra**	BAS011 **Statics**	BAS013 **Physics of Materials & Electricity**				

Matrix relating the program courses with competencies

Course Code	Course Name	Engineering Competencies (2018)										Electrical Engineering Competencies (NARS)					Communications and Electronics Engineering Competencies (ARS)				
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	C1	C2	C3	C4	C5
BAS010	Differential Calculus and Algebra	√							√			√									
BAS011	Statics	√							√												
BAS012	Engineering Chemistry	√							√												
BAS013	Physics of Materials & Electricity	√							√												
MEC010	Engineering Drawing (1)	√					√		√												
GEN010	Technical Language	√	√						√	√											
BAS014	Integral Calculus & Analytical Geometry	√							√			√									
BAS015	Dynamics	√							√												
BAS016	Physics of Light, Heat and Magnetism	√							√												
MEC011	Principles of Manufacturing Engineering	√	√				√		√		√										
MEC012	Engineering Drawing (2)	√			√				√												
GEN011	Computer Skills	√	√						√		√		√		√						
GEN012	History of Engineering & Technology	√		√					√	√											
BAS112	Differential Equations	✓							✓												
ELE121	Electrical Circuits *	✓	✓			✓			√			✓	✓								
ELE122	Physics of Semiconductors	√	√				√		√		√										

Course Code	Course Name	Engineering Competencies (2018)										Electrical Engineering Competencies (NARS)					Communications and Electronics Engineering Competencies (ARS)				
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	C1	C2	C3	C4	C5
ELE131	Computer Programming (1)	✓			✓		✓	✓		✓	✓			✓		✓	✓	✓			
ELE126	Mechanical and Civil Engineering	✓			✓	✓															
ELE123	Technical Reports					√	√		✓												
BAS113	Special Functions and Transformations	✓							✓												
ELE124	Electronics (1)	✓	✓			✓			✓				✓	✓	✓						
ELE125	Management of Engineering Projects	✓		✓			✓	✓	✓	✓											
ELE132	Computer Programming (2)	✓	✓	✓	✓	✓	✓	✓					✓	✓		✓	✓	✓			
ELE133	Design of Logic Circuits	✓	✓	✓		✓		✓			✓	✓	✓					✓		✓	
GEN110	Communication and Presentation Skills	✓		✓						✓	✓	✓									
BAS212	Partial Differential Eqs. & Numerical Analysis	✓							✓												
ELE221	Electronic Measurements *	√	√				√		√				√		√		√				
ELE222	Electrical and Magnetic Fields	✓				✓			✓						✓						
ELE231	Web Programming		✓	✓		✓	✓			✓				✓	✓						
ELE241	Electrical Power Engineering																				
GEN210	Human Rights and Anti-Corruption	✓		✓						✓	✓	✓									
BAS213	Statistics and Probability	✓							✓												
ELE218	Engineering Economics	✓		✓						✓	✓	✓									
ELE224	Signal Analysis and Systems	✓	✓										✓	✓	✓					✓	

Course Code	Course Name	Engineering Competencies (2018)										Electrical Engineering Competencies (NARS)					Communications and Electronics Engineering Competencies (ARS)				
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	C1	C2	C3	C4	C5
ELE225	Electronics (2)	✓	✓	✓									✓	✓	✓	✓					✓
ELE232	Computer Organization	✓	✓			✓					✓	✓			✓						
GEN211	Analysis and Research Skills	✓		✓						✓	✓	✓									
ELE321	Communication Systems	√	√			√							√	√	√		√				
ELE322	Computer Networks		✓	✓				✓					✓	✓	✓	✓	✓		✓		✓
ELE323	Electromagnetic Waves	✓		✓											✓			✓			
ELE334	Embedded Systems		✓							✓			✓				✓			✓	
ELE343	Electrical Machines and Control	✓	✓								✓		✓		✓						
GEN310	Entrepreneurship	✓		✓						✓	✓	✓									
ELE300	Field Training (1) *		✓		✓			✓						✓	✓		✓	✓	✓	✓	✓
ELE324	Digital Signal Processing	✓	✓							✓	✓	✓								✓	
ELE325	Digital and Wireless Communications			✓		✓	✓						✓	✓	✓		✓			✓	
ELE338	Information Security	✓			✓	✓		✓	✓					✓	✓	✓	✓	✓		✓	
ELE327	Microwave Engineering	✓	✓						✓		✓		✓		✓			✓			
ELE328	Electronic Circuits	√										√	√				√				√
GEN311	Professional Ethics		✓	✓		✓		✓	✓												
ELE421	Mobile Communications	✓	✓												✓	✓	✓				
ELE422	Antenna and Wave Propagation	√	√						√		√		√		✓			√			
GEN410	Critical Thinking	✓		✓						✓	✓	✓									

Course Code	Course Name	Engineering Competencies (2018)										Electrical Engineering Competencies (NARS)					Communications and Electronics Engineering Competencies (ARS)				
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	C1	C2	C3	C4	C5
ELE491	Graduation Project (1)	✓	✓			✓	✓	✓			✓		✓	✓	✓						✓
ELE 400	Field Training (2) *		✓		✓			✓						✓	✓		✓	✓	✓	✓	✓
ELE423	Industrial Electronics	✓		✓	✓		✓						✓	✓	✓			✓		✓	
ELE424	Optical Communications	✓		✓											✓		✓		✓		
GEN411	Human Resources Management		✓	✓		✓		✓	✓												
ELE492	Graduation Project (2) **	✓	✓			✓	✓	✓			✓		✓	✓	✓						✓
ELE425	Satellite Communications	✓	✓												✓	✓	✓				
ELE426	Rader Systems	✓			✓	✓									✓	✓	✓				
ELE427	Advanced Networks		✓	✓				✓					✓	✓	✓	✓	✓		✓		✓
ELE428	Acoustic Engineering	✓	✓			✓							✓		✓		✓				✓
ELE429	Information Theory	✓			✓	✓		✓	✓					✓	✓	✓	✓	✓		✓	
ELE451	Design of Very Large-Scale Circuits		✓										✓			✓					✓
ELE452	Visible Light Communications	✓		✓											✓		✓		✓		
ELE453	Robotics Systems	✓		✓	✓		✓						✓	✓	✓					✓	✓
ELE454	Microcontrollers Systems	✓	✓			✓	✓		✓		✓		✓	✓		✓					✓
ELE455	Adaptive Signal Processing	✓	✓							✓	✓	✓	✓	✓							✓

Course Code	Course Name	Engineering Competencies (2018)										Electrical Engineering Competencies (NARS)					Communications and Electronics Engineering Competencies (ARS)				
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	C1	C2	C3	C4	C5
ELE456	Selected Topics in Advanced Electronics					✓		✓	✓				✓	✓		✓					
ELE457	Selected Topics in Advanced Communications	✓	✓	✓			✓						✓	✓			✓				

Courses Description

PREPARATORY YEAR

BAS010 Differential Calculus and Algebra (2,2,0)

Differentiation: Elementary functions, Polynomials, Exponential, Logarithmic and trigonometric functions, Limits and continuity, Derivative, Implicit differentiation, Maximum and minimum values, Mean value theorem, Taylor’s expansion, Integration of Polynomials, Exponential and trigonometric functions, Definite integral.

Algebra: Matrices, Algebra of matrices, Eigenvalues and eigenvectors, Positive and negative matrices, Linear systems, Finite series, Complex numbers, Mathematical induction.

References:

1- Basic Technical Mathematics with Calculus Kindle Edition, Pearson; 11th Edition, 2017.
2- Textbook of Basic Mathematics: A Begginer's Guide To Geometry, Trigonometry and Calculus Kindle Edition, , 2017.

BAS011 Statics (2,1,2)

Application on space vectors, resultant of a set of forces, moments, equivalent couple moment, equations of equilibrium for rigid body, types of supports, statically determinate beams and trusses, equilibrium under influence of spatial forces and couples, center of mass (for particles and planer surface), moment of inertia (parallel axes, major axes, planer surface).

References:

1- Engineering Mechanics: Statics & Dynamics by Russell Hibbeler, Pearson; 14th Edition, 2015.

BAS012 Engineering Chemistry (2,1,2)

Gaseous state (gases law), chemical equilibrium and Le Chatellier, principle –solutions- phase diagram- basics of water treatment and desalination technology- Introduction on thermo chemistry and its rules, basics of fuel combustion, calorimetric and determination of heat of combustion –Electrochemistry and conduction in electrolytic solutions Electrochemical cells and Nernst equation- Corrosion of metals (types, methods of prevention of corrosion – ionic equilibrium and pH calculation- building materials and some petrochemicals industry.

References:

1- Engineering Chemistry: Alpha Science; Illustrated Edition, 2018

BAS013 Physics of Materials & Electricity (2,1,3)

Properties of matter : Physical quantities, standard units and dimensions, atomic structure (electronic distribution, classification of elements and energy levels), crystalline structure (crystalline grid, symmetry, vacuum groups, some simple examples of crystalline structure), stress and strain, mechanical properties of materials (tensile strength and yield stress, etc.,) Physical properties of liquids, viscosity, surface tension, Archimedes principles, Pascal's law, Bernoull's equation and their applications. Laboratory experiments. Electrical: charge and matter, Coulomb's law, electric field, Gauss's law, electric potential, capacitors and dielectric materials, electrical resistance and electromotive force, Ohm's law, simple electrical circuit, laboratory experiments.

References:

1- Modern Classical Physics: Optics, Fluids, Plasmas, Elasticity, Relativity, and Statistical Physics by Kip S. Thorne , Princeton University Press, 2017.
2- Basic Physics: A Self-Teaching Guide by K Kuhn, Noah Books, 2018

BAS014 Integral Calculus and Analytical Geometry (2,2,0)

Integration: Hyperbolic functions and inverse functions and their derivatives, derivatives of parametric relations, Methods of integrations, integration by partial fractions, parts, reduction and substitution, Applications of definite integrals for obtaining plane area, volumes, arc length and surface area.

Analytical geometry: Cartesian and polar coordinates, Equation of pair of lines, Equation of circle, Conic sections and their properties, Equation of plane, Equations of sphere, cone and cylinder.

References:

1- Basic Technical Mathematics with Calculus Kindle Edition, Pearson; 11th Edition, 2017.
2- Textbook of Basic Mathematics: A Begginer's Guide To Geometry, Trigonometry and Calculus Kindle Edition, , 2017.

BAS015 Dynamics (2,1,2)

Kinematics of Particle (rectilinear and curvilinear motion, Cartesian coordinates, projectile motion, natural coordinates, polar coordinates, relative motion), kinetics of Particle (acceleration force method), plane kinematics of rigid bodies (translational and rotational motion, general motion: relative velocities, instantaneous center of zero velocity, planer kinetics of rigid body, acceleration forces, work and energy, impact and momentum.

References:

1- Engineering Mechanics: Statics & Dynamics by Russell Hibbeler, Pearson; 14th Edition, 2015.

BAS016 Physics of Light, Heat and Magnetism (2,1,2)

Principles of heat and thermodynamics: Zero law, first and second Law of thermodynamics, heat transfer, gas theory, temperature measurement methods. Light and laser physics: general concepts of light, straight diffusion of light, Velocity of light diffusion, light beam, optical beams, geometric light, reflection and refraction, wave radiation modeling, wave dissipation, diffraction of light, introduction to lasers, Einstein's equations and magnification Light, Explanation of some lasers (gas, solid and liquid lasers), laser applications. Magnetism: magnetic field, Faraday magnetic law, magnetic induction, Boit-savart's law, Ampere's law, laboratory experiments.

References:

1- Modern Classical Physics: Optics, Fluids, Plasmas, Elasticity, Relativity, and Statistical Physics by Kip S. Thorne , Princeton University Press, 2017.
2- Basic Physics: A Self-Teaching Guide by K Kuhn, Noah Books, 2018

MEC010 Engineering Drawing (1) (0,3,0)

This is an introductory course teaches the basics of technical Drawing using manual drafting instruments. The topics include drawing tools, types of lines, sizes and layout of standard drawing sheets, lettering & numbering, scale use, drawing of geometrical figures, dimensioning, axonometric and isometric views, orthogonal and auxiliary projections, drawing of orthographic projection from isometric view.

References:

1- A Textbook of Engineering Drawing: Along with an Introduction to AutoCAD 2015 by Roop Lal, I K International Publishing House, 2015.

MEC011 Principles of Manufacturing Engineering (1,0,2)

The course introduces the basic concepts of production and productivity. The topics include classification of production processes, industrial safety, engineering materials, ferrous and non-ferrous alloys, steel and its types, cast iron and its types, steel and cast iron production, metal casting processes (sand casting, mold casting, centrifugal casting, wax casting, hot and cold metal forming processes (extrusion, forging, rolling, deep drawing, wire drawing, etc.), metal cutting processes (turning, milling, shaping, drilling, grinding, etc.), metal joining

techniques (welding processes, rivets, bolts … etc). Simple workshop measuring tools (Vernier caliper, micrometers, etc.), practical skills in workshops.

References:

1- Workshop Technology (Manufacturing Process) by S. K. Garg, Laxmi Publications; 3rd Revised edition, 2009.

MEC012 Engineering Drawing (2) (0,3,1)

Deduction of the missing orthogonal views, sections in machine members, hatching rules, intersections of solids and surfaces, development of surfaces, drawing of steel structures. Basics of computer aided drafting (CAD) using AutoCAD: Workspace, toolbars, coordinate systems, setting up 2D drawing environment, drawing tools in AutoCAD, object snap, modification tools in AutoCAD, texting and dimensioning in AutoCAD.

References:

1- A Textbook of Engineering Drawing: Along with an Introduction to AutoCAD 2015 by Roop Lal, I K International Publishing House, 2015.

FIRST YEAR

BAS112 Differential Equations (2,2,0)

Functions of several variables, Partial differentiation, Maximum and minimum values, Conditional extrema, Curvature, Double and triple integrals, Line integral, Ordinary differential equations, first order and higher order, Linear Systems of ordinary differential equations, Vectors analysis, Gradient, Laplace transformations, Inverse Laplace transformations.

References:

1- Differential Equations and Linear Algebra (Gilbert Strang), Wellesley-Cambridge; UK ed. Edition,2014.

2- Elementary Differential Equations and Boundary Value Problems by William E. Boyce et al., Wiley; 11th Edition, 2017.

BAS113 Special Functions and Transformations (2,2,0)

Periodic functions, Fourier series, Fourier integrals, Special functions, Gamma, Beta, Green function, Bessel functions, Z-transform, Inverse Z-transform, Integral equations.

References:

1- K. A. Stroud, Engineering Mathematics, Fifth Edition, Industrial Press Inc., New York. 2001.

2- E. Kreyszig, Advanced Engineering Mathematics, John Wiley and Sons, New York 1999.

ELE121 Electrical Circuits (2,2,1)

Basic DC circuit elements, series and parallel network, Ohm's law and 1st and 2nd Kirchoff's laws, Nodal analysis, Mesh analysis, Basic network theorems (source transformation, super position theorem, Thevenin's theorem, Norton's theorem, maximum power transfer, Time response of R-L and R-C circuits).

Practical part: Use of ammeters, voltmeters and function generators - Ohm's law - Series and parallel connections of resistors Voltage divider under load and no-load - Capacitor in a DC circuit - Relay circuit - Capacitor in an AC circuit - Coil in an AC circuit - Series and parallel connections of R , L and C- Resonance. Use of Function generators -Diode in the DC and AC circuit - Half-wave and bridge rectifiers - Zener diode.

References:

1. "Electric Circuit Fundamentals", Thomas l. Floyed ,9th Edition, Prentice Hall, 2009.

2. "Fundamentals of Electric Circuits", Charles Alexander, Matthew Sadiku, McGraw-Hill Education; 7th Edition, 2020.
3. ELO Training Kit Course for AC

ELE122 Physics of Semiconductors (2,2,1)

Basics of semiconductor physics–Fermi-Dirac distribution–Carriers concentrations–Intrinsic and Extrinsic materials–Charge neutrality–Currents in Semiconductors (drift current - diffusion current)–Semiconductor parameters (mobility, Scattering, life-time)–Hall effect–PN junction theory–Diode IV characteristics–Special purpose diodes (Light emitting diodes, photo diodes, Zener diode and LASER diodes) –Theory of operation and basics of Bipolar junction transistors. Basic DC analysis of the (BJT) and Biasing Techniques for the different amplifier configurations.

References:

1- Microelectronic circuits, Adel Sedra and Kenneth Smith, 8th Edition, 2020.
2- Electronics Principles by Albert Malvino and David J. Bates,2007.

ELE126 Mechanical and Civil Engineering (2,2,0)

Mechanical Eng.: The first law of thermodynamics - The second law of thermodynamics - Thermal machines - Inverted thermal machines - Entropy - Ideal gases and real gases - Reflex and non-reflexive procedures - Carnot cycle. Basic concepts of fluids - Fluid statics - Fluid flow characterization - Basic equations - Bernoulli's equation - Different applications on the equations of movement and Bernoulli's quantity - Flow in pipes and tubes .

Civil Eng.: An Overview of the Building Delivery Process, Loads on Buildings, Load Resistance—The Structural Properties of Materials, Structural systems, Thermal Properties of Materials, Fire - Related Properties, Principles of Sustainable Construction. Materials and systems of construction: The Material Steel and Structural Steel Construction, Lime, Portland Cement and Concrete, Concrete Construction, Soils; Foundation and basement Construction.

References:

1- Yunus A. Cengel, Michael A. Boles, Thermodynamics: An Engineering Approach, 5th Ed. McGraw-Hill College, Boston, MA, 2006
2- Y. Cengel and John Cimbala, Fluid Mechanics Fundamentals and Applications, 3rd Ed. McGraw-Hill College, Boston, MA, 2013
3- Madan Mehta, Walter Scarborough, Diane Armpriest, Building Construction: Principles, Materials, and Systems, Prentice Hall, 2009.

ELE123 Technical Reports (2,0,0)

Report Types and Patterns, Report Components, Summary Reports, Detailed Reports, Importance and Purposes of Reports, Text Writing, Graphical Representation, Reporting Methods, Presentation Bases, Types, Patterns and Components of Presentation Screens, Reference Research Methods and Documentation Methods, References -Training to write and deliver technical reports.

References:

1. "Technical Report Writing and Style Guide", Tony Atherton, Kindle Edition, 2020.

ELE124 Electronics (1) (2,2,1)

Diode applications such as rectification, logic circuits, peak detectors, voltage multipliers-Applications of special diodes such as photodiode, light emitting diode, and zener diode-BJT Low frequency analysis for the three different amplifier configurations - Different BJT Applications-Power supplies and switching mode power supplies-Regulators.

References:

1. Microelectronic circuits, Adel Sedra and Kenneth Smith, 8th Edition, 2020.
2. Electronic Principles, Albert Malvino and David Bates, 8th Edition, 2015.

ELE125 Management of Engineering Projects (2,1,1)

Introduction to project management, organizational structure of project, project planning, project scheduling, Gantt charts, project management networks, CPM, resource allocation and constraints, cost management, risk management, project performance measurement and control. Measuring project performance and monitoring , finishing and closing projects, using computers in planning and controlling projects using Microsoft Project.

References:

1. "Engineering Projects Management", Neil G. Siegel, Wiley; 1st Edition, 2020.

ELE131 Computer Programming (1) (2,0,3)

Introduction to structured programming, data types, expressions, control structures and loops, arrays, functions, structures, strings, pointers, exception handling, and files.

References:

1. "The C++ Programming Language", by Bjarne Stroustrup, 4th edition, Pearson Inc., 2013.
2. "Professional C++", by Marc Gregoire, 4th Edition, Wrox, 2018.

ELE132 Computer Programming (2) (2,0,3)

Fundamentals of Object-Oriented Programming (OOP), including objects, classes, methods, parameter passing, information hiding, inheritance, method overloading, overriding and polymorphism and their implementations using Java programming language.

References:

1. “Python 3 Object Oriented Programming”, by Dusty Phillips, Packt Publishing, 2018.
2. “Effective Java” , by Joshua Bloch, 3rd Edition, Addison-Wesley Professional, 2018 .

ELE133 Design of Logic Circuits (2,2,1)

Number systems, Boolean algebra, basic logical operations, gates and truth tables. Combinational logic: Minimization techniques, multiplexers and de-multiplexers, encoders, decoders, adders and subtractors. Sequential logic: Flip flops, mono-stable multi-vibrators, latches, registers, counters, and memories.

References:

1. “Digital Logic and Computer Design” By M. Morris Mano, Kindle Edition, Pearson, 2020.
2. “Logic and Computer Design Fundamentals”, by Morris Mano , Charles Kime, and Tom Martin, 5th Edition, Pearson, 2015.

ELE100 Summer Training (1)

The student performs a training during the summer inside the faculty, before the beginning of the first year, for 3 weeks upon different electronics, communications, and computer software packages such as MATLAB, ORCAD PSpice , LabVIEW, and Proteus.

References:

1- Laboratory book (Manual of Experiments)

SECOND YEAR

BAS212 Partial Differential Equations and Numerical Analysis (2,2,0)

Partial Differentiation and Derivatives of vector functions. Gradient/ Divergence/curl/Laplacian. Line integrals, line integrals independent of the path, exactness. Conservative vector fields. Double integrals in Cartesian and polar coordinates, Mathematical expectation, Numerical methods: Finding roots using bisection method, Newton's method, Solution of linear system of equations using Gauess method and matrix decomposition, Solution of partial D.E. (Heat and Wave equations), Lagrange and Newton Interpolation methods.

References:

1- E. Kreyszig, Advanced Engineering Mathematics, John Wiley and Sons, New York 1999

BAS213 Statistics and Probability (2,2,0)

Introduction in statistics and data analysis, Measures of central tendency, Measures of dispersion, Probability theory, Conditional probability, Random variable, Probability density function, Discrete probability distributions, Continuous probability distributions, Curve fitting, Linear regression, Nonlinear regression, Covariance, Correlation Coefficient, Inferences including the mean, Inferences include differences, Quality control.

References:

1- Joe D. Hoffman, Numerical methods for engineers and scientists, 2nd edition, Marcel Dekker, Inc. New York, 2001
2- John Schiller, R. Alu Srinivasanand Murray R. Spiegel, Schaum's Outline of Probability and Statistics, 4th ed.,McGraw Hill 2012.

ELE221 Electronic Measurements (2,2,1)

Measurements of errors, accuracy, judgments, sensitivity, and statistical analysis (mean - deviation - standard deviation - variance). Measurement units and standards, electromechanical measuring instruments, analog instruments (DC ammeter, DC voltmeter, ohmeter, bridge measurements (DC and AC bridges)-Transducers-Analog and digital oscilloscopes-Signal generators-Miscellaneous devices and circuits (Strip chart Recorders, X-Y recorders, plotters, printers)- Introduction to Data acquisition and computerized control measurements.

References:

1- "Electronic Instrumentation and Measurements", David A. Bell, 2013.

ELE222 Electrical and Magnetic Fields (2,2,1)

Vector analysis, Electrostatic fields: Coulomb's law and electric field intensity, electric flux density, Gauss's law and divergence, energy and potential, conductors, dielectrics and capacitance, Poisson and Laplace equations. Steady magnetic fields: Magnetostatic fields: Biot-Savart's w, Ampere's law, curl and Stokes's theorem, magnetic flux density, magnetic forces, Lorentz force, materials and inductance.

References:

1- Introduction to Electromagnetic fields, Clayton R. Paul, McGraw-Hill, 1987.
2- Engineering Electromagnetics, William H. Hayt, McGraw-Hill, 1989.

ELE224 Signal Analysis and Systems (2,2,1)

Representation of signals in the time and frequency domain, classifications of signals and systems, signal processes, linear time invariant systems representations, convolution. Laplace transform and its applications. Fourier series; the continuous and intermittent Fourier transform and their applications, spectral representation, sampling, power and energy spectrum. Applications using Matlab.

References:

1. "Signals and systems", Alan V.Oppenheim, Alan S.Wilsky, 2nd edition, Prentice Hall, 1997.
2. "Signals and systems", Simon Haykin, Barry Van Veen, 2nd edition, Wiley India Pvt. Limited, 2007.

ELE225 Electronics (2) (2,2,1)

Field Effect Transistors (FET) and Metal Oxide Semiconductor Field Effect Transistors (MOSFET), physical operations, DC and AC characteristics, Special Effects, Applications-Fabrication of integrated circuits-TTL and MOS circuits-Optoelectronic Devices-Switching devices (four layer devices: Thyristor, Diac, Triac,..).

References:

1- Microelectronic circuits, Adel Sedra and Kenneth Smith, 8th Edition, 2020.
2- Louis E. Frenzel, Jr. "CONTEMPORARY ELECTRONICS: FUNDAMENTALS, DEVICES, CIRCUITS, AND SYSTEMS", McGraw-Hill 2014.

ELE231 Web Programming (2,0,3)

Introduction to web application, fundamentals of HTML language, fundamentals of CSS language, creating a static webpage, fundamentals of JavaScript language, fundamentals of PHP language, creating dynamics webpages, link the webpages with database via SQL.

References:

1. “Fundamentals of Web Development”, by Randy Connolly and Ricardo Hoar, 2nd Edition, Pearson Inc., 2017.
2. “Creating Data-Driven Web Sites: An Introduction to HTML, CSS, PHP, and MySQL”, by Bob Terrell, Kindle Edition, Momentum Press, 2019.

ELE232 Computer Organization (2,2,1)

Simple Processor organization, Instruction sets, Addressing modes, Assembly language, CPU organization, Control signals, Hardwired control, Micro-programmed control, ALU Design, Binary adder, Subtractor, Multiplier, Memory Organization, Main Memory, Cache Memory, Virtual Memory, I/O organization, Interrupts, DMA, Bus transfers.

References:

1. “Computer Organization and Design”, by David A. Patterson, John L. Hennessy and Morgan Kaufmann, 5th Edition, Pearson, 2017.
2. “The Essentials of Computer Organization and Architecture”, by Linda Null, 5th edition, Jones & Bartlett Learning, 2018.

ELE241 Electrical Power Engineering (2,2,0)

Introduction to electric power systems - components of electric power system - power plants - electric transmission lines (overhead transmission lines - ground cables) - electrical distribution systems - types of distribution systems - substations - electrical transformers - circuit breakers - overvoltage in power systems - Overvoltage protection devices - Isolation in different electrical power systems.

References:

1. “Fundamentals of Electrical Power Engineering”, Isaak D Mayergoyz, Patrick Mcavoy, World Scientific, 2014.

ELE226 Engineering Economics (2,2,0)

Introduction to economics: economic concepts, types of market, supply and demand law, flexibility, different economic systems, income and cash flow calculation, corporate objectives, balance sheet. Introduction to Engineering Economics: Engineering decision-making, break-even analysis, recovery time method, and production function. Time value of money: simple interest, compound interest, principle of economic parity and separate cash flow, trade-offs between projects, nominal interest rate and real rate. Internal Rate of Return (IRR): calculation of the internal rate of return achieved using the present wealth equation, calculation of the internal rate of return realized using the equivalent annual wealth formula and calculating the internal rate of return for several alternatives using the annual equivalent equation. Depreciation models: the nature of depreciation, calculation of depreciation rates by conventional methods.

References:

1- Leland Blank & Anthony Tarquin, Basics of Engineering Economy, McGraw - Hill, 2008

ELE200 Summer Training (2)

The student performs a training during the summer inside the faculty, before the beginning of the second year, for 3 weeks upon different electronics, communications, and computer software packages such as MATLAB, ORCAD PSpice , LabVIEW, and Proteus.

References:

1- Laboratory book (Manual of Experiments)

THIRD YEAR

ELE321 Communication Systems (2,0,3)

Introduction to Communication systems, meaning of modulation, Analog modulation, Amplitude Modulation (AM, DSS-SC, SSB and VSB generation and detection), Angle modulation (PM, FM generation and detection), PCM - DPCM - Delta Modulation, Multiplexing, Spread spectrum, Digital modulation.

References:

1. Modern Digital and analog communication system, Lathi Ding, Oxford University Press; 5th Edition, 2018.
2. Electronic communication, Roddy and Coolen, Pearson Education, 4th Edition, 2008.

ELE322 Computer Networks (2,0,3)

Networking basics (building and configuring networks - types of networks - network components) - OSI reference model and practical model TCP/ IP - Physical layer (cables - data encryption and decoding - determination of data rates) - Data link layer (Error detection and correction) - Network layer (Internet protocol, routing and switching) - Transport layer (TCP and UDP protocols) - Application layer (Telnet-HTTP-DHCP-DNS protocols) - Using simulation tool (packet tracer) to implement static and dynamic switch protocols.

References:

1. Data Communications and Networking, Behrouz A Forouz, McGraw-Hill Education; 5th Edition, 2012.
2. Data Communications and Networking, by M Chandra Sekhar Reddy and Dr P.V.N Reddy, LAP LAMBERT Academic Publishing, 2020.

ELE323 Electromagnetic Waves (2,0,3)

Time-varying fields. Maxwell's equations and the wave equation. Plane waves in homogeneous media. Phasor form of time-varying electromagnetic fields. Poynting theorem in real and complex form. Types of wave polarization. Boundary conditions. Reflection and transmission of electromagnetic waves at plane interfaces. Standing wave phenomenon. Normal and inclined incidence of electromagnetic waves at planar interfaces. Total internal reflection. Brewster angle. Elementary waveguide: the parallel-plate waveguide, modes of propagation, cutoff, group and phase velocities.

References:

1. "Field and Wave Electromagnetics", David K. Cheng, PEARSON INDIA; 2nd Edition , 2014.
2. "Engineering Electromagnetics", W. Hayt, 8th edition, McGraw-Hill , 2011.

3. “Foundations for Microwave Engineering” ,R. Collin, second edition, McGraw-Hill , 2001.

ELE324 Digital Signal Processing (2,0,2)

Discrete-time sequences and systems, the Z-transform and its inverse, Fourier transforms and frequency response, periodic sampling and reconstruction of band limited signals, digital filter design, filter transformations, the discrete and fast Fourier transform, Fourier analysis, the effect of windowing, correlation, convolution and de-convolution.

References:

1. Digital Signal Processing; A practical guide for Engineers and Scientists, Steven Smith, Newnes,2002.
2. Digital Signal Processing: Fundamentals and Applications, Lizhe Tan, Jean Jiang, Academic Press; 3rd Edition , 2018.
3. Understanding Digital Signal Processing, Richard G. Lyons, Second Edition, PEARSON INDIA; 3rd Edition , 2011.

ELE325 Digital and Wireless Communications (2,0,3)

Digital and analog communication systems, multiple access techniques, Digital transmission, Channel coding, OFDM , Multi-path propagation, Delay spread values ,Guard time and cyclic extension ,OFDM parameters ,OFDM versus single carrier modulation , Multiple-Input Multiple-Output (MIMO) Systems , Relay-based Wireless systems , Network Coding (Analog/digital/Lattice) ,Simulation of wireless communication systems.

References:

1. Digital Communications , John G. Proakis, McGraw-Hill Companies , 5th edition, 2018.
2. Fundamentals of Digital Communication , Upamanyu Madhow ,2012.
3. Wireless Communications Systems: an Introduction, by Haupt, Wiley-IEEE Press; 1st Edition, 2019.

ELE327 Microwave Engineering (2,0,3)

Theory of guided waves and the concept of “modes”. Rectangular Waveguides. Cylindrical waveguides. Losses in waveguides. Types of cavity resonators. Characteristics of elementary planar waveguide structures. The strip lines as a guiding structure.

References:

1. "Microwave Engineering" David M. Pozar ,4th Edition Wiley publishing:2011 (ISBN-10: 0470631554).
2. "Handbook of Microwave Technology, Volume 1: Components and Devices" T. Koryu Ishii, Academic press 1995.

ELE328 Electronic Circuits (2,0,3)

Low and high frequency signal circuits and amplifiers - nature of high frequency signals - types of transformers and impedance adapters - types and characteristics of low and high frequency linear discrete and integrated circuits - basic filters - frequency converters - high frequency receivers - types of power amplifiers - oscillators and closed-phase loops.

References:

1. "High Frequency Communication Circuits", Sorin Voinigescu , Cambridge University Press; 1st Edition, 2013.
2. High Frequency Communication and Sensing: Traveling-Wave Techniques (Devices, Circuits, and Systems) , Ames Tekin, Ahmed Emira, 1st Edition, 2014.
3. "Wireless Communication Electronics: Introduction to RF Circuits and Design Techniques", Robert Sobot, secod ed. Springer 2021

ELE334 Embedded Systems (2,0,2)

Embedded processor architecture and programming, I/O and device driver interfaces to embedded processors with networks, video cards and disk drives. Using operating systems primitives for concurrency, timeouts, scheduling, communication and synchronization, Real-time resource management techniques, and application-level embedded system design concepts such as basic signal processing and feedback control.

References:

1. "Embedded Systems Architecture ",by Daniele Lacamera, Packt Publishing, 2018.
2. "Embedded Systems: A Contemporary Design Tool" By James K. Peckol, 2nd edition, Wiley, 2019.

ELE338 Information Security (2,0,2)

This course introduces an overview of information security. Principles of security including confidentiality, integrity, and availability. Exploration of topics in computer security, threats and defense mechanisms for computer systems by introducing classic cryptographic algorithms, Encryption and privacy: Public key, private key, symmetric key ,protocol analysis, access control, authentication protocols, Packet filtering, Firewalls, Virtual private networks, Intrusion detection systems.

References:

1. "Fundamentals of Information Systems Security", by David Kimis and Michel Solomon, 3rd edition, Jones & Bartlett Learning, 2016.
2. "Introduction to Cryptography and Network Security", by Behrouz A.Forouzan, McGraw-Hill International Edition, 2014.

ELE343 Electrical Machines and Control (2,2,0)

DC machines: installation of DC machine, electric motors, DC generators (working theory, types, equivalent circuit, benefits and efficiency), DC motors (working theory, types, equivalent circuit, efficiency, torque), single-phase electric transformers (working theory, equivalent circuit, vector shape drawing, tests, voltage regulation and efficiency). Automatic control: definition of open-loop and closed-loop systems, control system components, mathematical models of physical systems (mechanical, electrical, electromechanical systems), simplification of the box diagram, signal flow graph, transient response of first and second order control systems, poles / zeros, Stability analysis by Ruth Herwitz.

References:

1. "Modern Control Systems", by by Richard Dorf and Robert Bishop, 13th Edition, Pearson, 2016.
2. "Electrical Machines, Drives and Power Systems", by THEODORE WILDI, Pearson New International Edition, 2005.

ELE300 Field Training (1) (0,0,0)

Students should spend 4 weeks in field training, after completing the Second level, in any Engineering Institution or Engineering Firms. Students should demonstrate the professional and practical skills they acquired during discussion with their assigned tutors.

FOURTH YEAR

ELE421 Mobile Communications (2,0,3)

Introduction to mobile communications. Cellular concepts: cell design, hand-off, traffic intensity. Radio wave propagation effects. Multipath and fading channel, diversity reception, RAKE receiver. Digital modulation and multiple access techniques. Overviews of existing and emerging wireless mobile communication systems.

References:

1. "Data_Communications_and_networking", A. Behrouz Forouzan, 5th edition, McGraw-Hill Education (India), 2012.
2. "Communication Systems for the Mobile Information Society", Martin Sauter,2006
3. "Fundamentals of Digital Communication" ,Upamanyu Madhow, Cram101, 2012.
4. "Fundamentals of wireless communication", David Tse, Pramod Viswanath, 2005.

ELE422 Antenna and Wave propagation (2,0,3)

Concepts of radiative elements in electromagnetism. Basic antenna parameters. Radiation and antenna characteristics. Receiving and transmitting antennas. Types and characteristics of linear antennas. Types and characteristics of antenna arrays. HF and microwave antennas.

References:

1. "Antenna theory analysis and design", Constantine A. Balanis, Wiley; 4th Edition, 2016.

ELE423 Industrial Electronics (2,0,2)

Introduction to industrial process- Sensors - Analog signal conditioning - Digital signal conditioning - Controller Principles - Analog Controllers -Programmable Logic Controller (PLC) - SCADA Systems - Principle of power electronics.

References:

1. “Introduction to Instrumentation, Sensors, and Process Control”, William C. Dunn, Artech House Sensors Library, 2008.
2. “Process Control Instrumentation Technology”, Curtis Johnson, 8/E, Prentice Hall, 2006.
3. “CONTEMPORARY ELECTRONICS: FUNDAMENTALS, DEVICES, CIRCUITS, AND SYSTEMS”, Louis E. Frenzel, Jr. , McGraw-Hill 2014.
4. ”Programmable Logic Controllers: Programming methods & Applications”, J. R. Hackworth & F.D. Hackworth, Jr. , Prentice Hall 2003.

ELE424 Optical Communications (2,0,2)

Foundations of recombination processes in semiconductors. Radiative and non- radiative recombination. Electroluminescence in semiconductors. Radiative recombination spectrum of light emitting diodes. Frequency response and modulation characteristics of LED. Fundamentals of laser action in semiconductors. The Laser Diode: operation and Power-Current characteristics. The frequency response of the laser diode. Laser radiation pattern. Basic laser diode circuitry. Semiconductor photo detectors. Fiber modes and types of dispersion. Fundamental characteristics of practical fibers. Optical fiber link design and power budget evaluation. Speed of data transmission over attenuation and dispersion-limited fiber link.

References:

1. "Fiber-Optic Communication Systems" Third Edition, GOVIND P. AGRAWAL, John Wiley & Sons, Inc. , 2010.
2. "Laser Communication Systems", W. K. Pratt, Wiley, New York , 1969.
3. "Optical Fiber Communication Systems", L. Kazovsky, S. Bendetto, and A. E.Willner, Artec House, Norwood, MA, 1996.

ELE425 Satellite Communications (2,0,3)

Orbital aspects of satellite communication, Spacecraft and its related systems, Satellite link design, Modulation and multiplexing techniques for satellite links, Multiple access techniques; FDMA, TDMA. Spread-Spectrum technique, Forward error correction code for digital satellite links, Earth station technology, Satellite TVRO network.

References:

1. "Satellite Communications Systems: Systems, Techniques and Technology", Gerard Maral, Michel Bousquet, et al. , 2020.
2. "Satellite Communication", Timothy Pratt, Jeremy E. Allnutt, Wiley; 3rd Edition, 2019.

ELE426 Radar Systems (2,0,3)

Basics of Radio Direction and Ranging. Radar frequency Range Equations. Radar Cross Section. Clutter, Noises and Jamming. Basic Elements of Radar Systems: Antenna, Transmitter, Receiver, Signal Processor and display. Continuous Wave Frequency Modulated. Continuous Wave, Pulse and Pulse Doppler Radar. Target Tracking techniques such as Monopulse, Sequential Lobing and Conical scanning. Applications of Radar in the field of Remote sensing.

References:

1. "Introduction to Radar Systems", M. I. Skolnik, McGraw-Hill,2006 (Third edition).

ELE427 Advanced Networks (2,0,3)

Networks SDN: Background and Motivation, Architecture, Open Flow protocol, SDN Deployment Models - Modern Network Applications: Cloud Computing, Big Data Systems, The Internet of Things.

References:

1. Software Networks: Virtualization, SDN, 5G, and Security (Networks & Telecommunications; Advanced Networks) by Guy Pujolle, 2020.
2. A Practical Guide to Advanced Networking, Jeffrey S. Beasley, Piyasat Nilkaew, Pearson IT Certification; 3rd Edition, 2012.

ELE428 Acoustic Engineering (2,0,3)

Plane and spherical waves – Simple and compound sound sources–Dynamically analogous mechanical and acoustical circuits – Acoustic transducers – Loudspeakers; types and systems –Microphone; types and systems – Measurements of sound – Acoustics and hearing – Acoustic environment outdoors – Acoustic environment indoors– Ultrasonic applications.

References:

1. "Master Handbook of Acoustics", F. Alton Everest, Ken C. Pohlmann, McGraw-Hill Education TAB; 6th Edition, 2014.
2. Surface Acoustic Wave Filters: With Applications to Electronic Communications and Signal Processing (Studies in Electrical and Electronic Engineering) by David Morgan, Jul 27, 2010.

ELE429 Information Theory (2,0,3)

Entropy, Relative entropy, Mutual information, Source entropy rate, Kraft inequality, Huffman code, Typical sequences and the asymptotic equipartition property, Lempel-Ziv coding, Channel capacity, Noisy channel coding theorem for discrete memoryless channels, Jointly typical sequences, Error exponents, Joint source channel coding theorem, Feedback, Low-density parity check codes and iterative decoding, Polar codes and successive decoding, Multiple access channels, Broadcast channels, Distributed source coding.

References:

1. Information Theory for Electrical Engineers (Signals and Communication Technology) by Orhan Gazi, 2018.
2. "Information theory", James V Stone, Sebtel Press; 1st Edition, 2015.

ELE451 Very Large-Scale Circuits Design (2,0,3)

Introduction to High Density Integrated Circuits - Manufacturing Integrated Circuits - Digital Systems - Digital Component Design - Design Methods and Tools.

References:

1. "CMOS VLSI Design: A Circuits and Systems perspective", David Money Harris, Neil Weste, Pearson; 4th Edition, 2010.
2. VLSI for Wireless Communication by Bosco H. Leung 2002.

ELE452 Visible Light Communications (2,0,3)

Introduction and motivation, History of Visible Light Communication (VLC) , What is LiFi and differences to VLC, Advantages of LiFi , Common misconceptions, Channel modeling, Digital modulations techniques for LiFi. MIMO in LiFi , Multi-user access in LiFi , LiFi attocellular networks and performance.

References:

1. "Visible Light Communications: Theory and Applications", Zabih Ghassemlooy CEng, Luis Nero Alves, Luis Nero Alves, 2017.

ELE453 Robotic Systems (2,0,3)

Robot History - Robot Sensors - Actuators- Principle of Robot Vision -Kinematics& Inverse Kinematics- Frames transformation - Behavior programming - Localization - Mapping-Navigation - Manipulator's Kinematic- Case study.

References:

1. "Robot Modeling and Control", M. Spong, S. Hutchinson and M. Vidyasagar, Wiley, 2005.
2. "Introduction to Robotics: Analysis, Control, Application", S. Niku, Wiley, 2011.

ELE454 Microcontrollers Systems (2,0,3)

Microprocessor structural architecture - Microprocessor internal modules - Assembly language - Programming using assembly language - Microprocessor coping devices - Introduction to microcontroller - Microcontroller structural construction - Microcontroller applications.

References:

1. "Computer Organization & Design: The Hardware/Software Interface", David A. Patterson and John L. Hennessy, 4th Edition, Morgan Kaufmann Publishers, 2013.

ELE455 Adaptive Signal Processing (2,0,3)

Least mean square algorithm, Recursive least square algorithm, variants of LMS algorithm: SK-LMS, N-LMS, FX-LMS. Adaptive FIR & IIR filters, application of adaptive signal processing: System identification, Channel equalization, adaptive noise cancellation, adaptive line enhancer.

References:

1. "Adaptive Signal Processing: Next Generation Solutions", by Tulay Adali and Simon Haykin, 2010.
2. "Adaptive signal processing", Bernard Widrow, Pearson; 1st Edition.

ELE456 Selected Topics in Advanced Electronics (2,0,3)

Selected topics related to the state of the art of Advanced Electronics.

References:

1. "Advanced electronic communications systems", Wayne Tomasi, Pearson; 6th Edition , 2013.
2. ADVANCED HIGH SPEED DEVICES (Selected Topics in Electronics and Systems) by MICHAEL S SHUR and PAUL MAKI, 2009.

ELE457 Selected Topics in Advanced Communications (2,0,3)

Selected topics related to the state of the art of Advanced Communications.

References:

1. "Advanced Communication Systems", by Djordjevic, Springer; 1st Edition, 2018.
2. "Design of High-Speed Communication Circuits (Selected Topics in Electronics and Systems)" by Ramesh Harjani, 2006.

ELE491 Graduation Project (1) (0,0,3)

The topics proposed for the graduation projects are collected from the faculty members, the students are divided into groups, each group selects one of the proposed projects, and each group implements the following activities: Review previous studies; Plan project implementation, analyze project requirements, collect data needed to implement the project, design the proposed solutions. Preparing the initial project documentation, initial presentation of the theoretical part of the project.

ELE492 Graduation Project (2) (0,0,5)

A continuation of ELE491, students implement the practical part of the project through the following activities: implementing the designed components in the first phase of the project using appropriate tools according to the nature of the project, component testing, integration of implemented components, system testing, analysis and evaluation of results, project documentation, project presentation.

ELE400 Field Training (2) (0,0,0)

Students should spend 4 weeks in field training, after completing the third level, in any Engineering Institution or Engineering Firms. Students should demonstrate the professional and practical skills they acquired during discussion with their assigned tutors.

UNIVERSITY REQUIREMENTS

GEN0X0 Technical Language (2,0,0)

Characteristics of the English or German or French technical language, grammar review, effective sentences and their characteristics, identify some common mistakes in the writing of technical sentence, paragraph construction, types of paragraphs, development of communication skills by reading and analysis of excerpts from technical writing in various engineering disciplines such as mechanical, electrical , civil ... etc.

References:

1- Mark Hancock & Annie McDonald, English Result - Intermediate Level, Oxford University press, Last Edition.
2- Durrell, Martin, “Using German: a guide to contemporary usage / Martin Durrell”, Cambridge, U.K. ; New York : Cambridge University Press, 2003.
3- Coffman Crocker, Mary E, “, Schaum's outline of French grammar”, McGraw-Hil, Schaum's outline series, 1999, 4th ed.

GEN011 Computer Skills (1,0,1)

IT concepts and terminology, Computer hardware, operating systems, Computer networks, Internet, Computer graphics, Multimedia systems, Databases. Practical applications: Operating system (Microsoft Windows), Word processing (Microsoft Word), Spreadsheets (Microsoft Excel), Microsoft PowerPoint, Databases (Microsoft Access). Introduction to programming concepts, programming languages and their classification, logical design of programs and algorithms, structural programming and object-oriented programming.

References:

1- Practice using ICDL components

GEN012 History of Engineering & Technology (2,0,0)

The definition of science, technology, engineering and architecture. The development of civilizations and their relationship to human sciences (ancient Egyptian civilization, Roman and Greek civilization, Mesopotamia, dark ages, industrial revolution). Different engineering disciplines and their role in society. The historical relationship between science and technology. The relationship between the development of engineering, the social and economic development of the environment, the challenges of globalization and the new economy. The contribution of engineers in the new millennium, the issues of economic and industrial development in Egypt.

References:

1- James E. McClellan & Harold Dorn, Science and Technology in World History: An Introduction, The Johns Hopkins University Press, 2nd. Ed., 2006.
2- Richard Shelton Kirby, Engineering in History, Dover publications, 1990.

GEN900 Communication & Presentation Skills (1,1,0)

General introduction to communication, the importance of communication, types of communication, communication barriers, listening skills, attributes and methods of reading, verbal communication: speaking and writing skills, non-verbal communication, dialogue skills and strategies of persuasion, communication in the work environment, writing CVs, reports and official letters.

References:

1- Gary Johns and Alan M. Saks, Organizational Behavior, Addison Wesley Longman, 2009.
2- Scgermerhorn, Jr., R. J., Hunt, G. J., and Osborn, N. R., Organizational Behavior, John Wiley & Sons, Inc., New York, 10th. Ed., 2008.

GEN901 Theory of Sustainability (1,1,0)

The course aims to introduce students to the concept of sustainability and its feasibility in order to develop its capabilities to reach architectural applications that contribute to achieving the goals of sustainability and its usefulness and to clarify the risks of unsustainable environment. The course deals with the components of the natural environment and the factors of preserving its components and equilibrium, the biological system, cycles and ecological chains, the presence characteristics of natural resources, energy and biological systems. Rapid development of sustainability applications and their comprehensiveness based on modern means of communication and digital technologies.

References:

1- Perspectives for a New Social Theory of Sustainability, Mariella Nocenzi and Alessandra Sannella, Springer Nature Switzerland 2020 .

GEN902 Human Rights and Combating Corruption (1,1,0)

Human rights: general introduction, definition of human rights, characteristics and principles of human rights, general rules of the idea of human rights, historical development of the idea of human rights, types of human rights, individual rights, collective rights (people's rights), sources of human rights, legal system of rules of protection Human rights, human rights according to the Egyptian constitution in 2014, the duties and obligations of individuals in society. Combating corruption: definition of corruption, its causes, effects and characteristics, types of corruption and its causes, the impact of corruption on human rights and development, the impact of corruption on economic rights and sustainable development, criminal confrontation of corruption.

References:

1- Peter Joseph , The New Human Rights Movement: Reinventing the Economy to End Oppression, Inc. Blackstone Audio: Books, 2017

GEN903 Research and Analysis Skills (1,1,0)

Scientific thinking and its characteristics, definition of scientific research and its characteristics, steps of scientific research (selection of the subject of research, determine the problem of research and selection factors, determine the framework of research, determine the method of research, data analysis), types of scientific studies: exploratory studies, descriptive studies, experimental studies . Methods of scientific research: descriptive approach, social survey, content study, content analysis. Data collection tools: Metrics, observation, interview, questionnaire. Data presentation and analysis methods: Descriptive methods, deductive methods.

References:

1- Gary Johns and Alan M. Saks, Organizational Behavior, Addison Wesley Longman, 2009.
2- Scgermerhorn, Jr., R. J., Hunt, G. J., and Osborn, N. R., Organizational Behavior, John Wiley & Sons, Inc., New York, 10th. Ed., 2008.

GEN904 Entrepreneurship (1,1,0)

Concepts in Entrepreneurship, Entrepreneurship and Small Enterprises, Generating Ideas for Entrepreneurial Projects, University and Entrepreneurship Opportunities and Challenges, Marketing Plan, Operational Plan, Financial Plan, Business Plan Writing, Technological Environment of Entrepreneurship, External Business Environment of Entrepreneurial Projects, Support Programs for Leading Projects Egyptian Economy, Entrepreneurial Project Presentation Skills.

References:

1- Entrepreneurship: An Evidence-Based Guide by Robert A Baron Edward Elgar Pub., 2012.

GEN905 Professional Ethics (1,1,0)

The course provides the background needed to discuss the core topics of engineering ethics, with a focus on the ethical issues facing engineers in the areas of engineering work in companies. The course includes the definition of the general elements of the ethics of the profession and the observance of the public interest and regulations and regulations, obligations to the community, the responsibilities of engineers, disclosure of violations, behavior, basic principles and codes of the ABET code of conduct of engineers.

References:

1- William Frey, Professinnal Ethics in Engineering, November, 2013, http://cnx.org/content/col10399/1.4/

GEN906 Critical Thinking (1,1,0)

Theoretical concepts (memory, thinking, creativity), an introduction to the thinking skills, the nature of thinking (definition, characteristics, levels), types of thinking (creative, critical, scientific), cognitive thinking skills, meta-cognitive thinking skills, thinking measurement tools, strategies Used in the development of thinking skills, programs to teach thinking skills, methods of teaching thinking skills.

References:

1- Critical Thinking: A Beginner's Guide to Critical Thinking, Better Decision Making and Problem Solving Paperback, by Jennifer Wilson,, Create Space Independent Publishing Platform 2017.

GEN907 Human Resources Management (1,1,0)

Historical development of human resources management, key functions of human resources management, human resources planning, access to human resources, training and development of human resources, compensation of human resources, human resource conservation.

References:

1- Human Resource Management, University of Minnesota Libraries Publishing, 2016

GEN908 Contracts and Legislation (1,1,0)

The course aims to provide the student with the technical and legislative knowledge related to the practice of the profession. The study of building legislation, urban planning and the laws governing the practice of the profession and the work systems (engineer / owner / contractor / ...) at the local and international levels as well as studying the methods of contracting/rules and systems for the preparation of integrated implementation documents. Tenders and methods of their examination and evaluation.

References:

1- Randall S. Schuler, Susan E. Jackson, Strategic Human Resoure Management , Wiley, 2nd ed., 2007.

2- Lewicki, J. R., Saunders, M. D., and Barry, B., Essentials of Negotiation, McGraw - Hill, 5th. Ed., 2011.

GEN909 Method of Scientific Research and Writing (1,1,0)

The course aims to develop the student's abilities to conduct applied scientific research in one of the fields presented for the graduation project and train to work within a research team, while following the steps of sound scientific research to draw conclusions. The elements and components of scientific research: research problem, scientific method to solve problems and fundamental differences between different scientific research methods, methods of collecting data and statistics necessary for research, methods of examination and analysis of data and information and scientific dealing with variables, formulation of research hypotheses, methods of discussion and examination of hypotheses, drawing conclusions. Scientific method of writing a scientific research (thesis writing). The students select one of the problems in the architectural, urban or any technical field, previously presented as the basis for the graduation project, to conduct the necessary scientific research. Finally, the student is discussed orally through a committee to evaluate the student's performance, within his group, and his findings, studies, analyzes, conclusions and recommendations for the graduation project thesis.

References:

1- Research Methodology and Scientific Writing, by C. George Thomas, Ane Books Pvt. Ltd., 2016

COMPUTER SYSTEMS ENGINEERING PROGRAM

Program Information

1. **Faculty vision:**

   The faculty of Engineering at Shoubra, Benha University, aspires to be a pioneering college at the national, regional and international levels in the fields of engineering education, scientific research, innovation and entrepreneurship in order to achieve the goals of sustainable development.

2. **Faculty Mission**

   The faculty of Engineering at Shoubra is committed to prepare a graduate with competencies and problem-solving skills[1] that qualify each engineer to compete in local and regional labor markets[2], the graduate will be able to innovate and become an entrepreneur[3], the faculty is also committed to the development of engineering sciences[4] and producing internationally distinguished scientific research[5], within the framework of human values and social responsibility[6].

3. **Program Vision**

   The Computer Systems Engineering Program, faculty of Engineering at Shoubra, aspires to be a pioneering program in education and scientific research in the fields of computer systems engineering at the regional and international levels and to provide an outstanding community service to the community and the surrounding environment.

4. **Program Mission**

   The Computer Systems Engineering Program, faculty of Engineering at Shoubra, is committed to preparing a graduate equipped with knowledge and skills[1] in the field of computer systems engineering that qualifies him to compete in the labor market[2], and to produce scientific research[3] and distinguished community participation[4], within the framework of human and moral values[5].

To judge the compatibility between the program mission and faculty mission, the following matrix is used.

Key Words of Faculty Mission / Key Words of Program Mission	prepare a graduate with competencies and problem-solving skills [1]	compete in local and regional labor markets [2]	innovate and become an entrepreneur [3]	development of engineering sciences [4]	producing internationally distinguished scientific research [5]	human values and social responsibility [6].
Preparing a graduate equipped with knowledge and skills [1]	√		√	√		
compete in the labor market [2]		√	√			
produce scientific research [3]	√				√	

distinguished community participation [4]			√			√
human and moral values [5]					√	√

5. Program aims

The Computer systems Engineering program aims to:

1. Apply knowledge of mathematics, science, and engineering concepts to define, formulate, and solve engineering problems.
2. Use the techniques, skills, and modern engineering tools necessary for intelligent computing.
3. Use artificial intelligence approaches to solve complex problems.
4. Use appropriate software and specialized tools in all stages of the systems development life cycle and achieve acceptable quality standards in software development.
5. Evaluate the characteristics, performance of components and processes of computer systems.
6. Design and conduct experiments, analyze and interpret the results.
7. Manage projects related to computer systems that are subject to economic, environmental, and social constraints.
8. Work efficiently within multi-disciplinary teams and communicate effectively.
9. Develop skills related to creative and critical thinking in solving problems.

To judge the compatibility of program mission with its objectives, the following matrix is used:

Key Words of Program Mission / **Program Objectives**	Preparing a graduate equipped with knowledge and skills	compete in the labor market	produce scientific research	distinguished community participation	human and moral values
Objective #1	√	√			
Objective #2	√		√		
Objective #3	√		√		√
Objective #4	√	√			√
Objective #5	√		√		√

Objective #6	√		√		
Objective #7		√		√	√
Objective #8	√			√	
Objective #9	√	√	√	√	

6. Graduate Attributes

1. Master a wide spectrum of engineering knowledge and specialized skills and can apply acquired knowledge using theories and abstract thinking in real life situations;
2. Apply analytic critical and systemic thinking to identify, diagnose and solve engineering problems with a wide range of complexity and variation;
3. Behave professionally and adhere to engineering ethics and standards;
4. Work in and lead a heterogeneous team of professionals from different engineering specialties and assume responsibility for own and team performance;
5. Recognize his/her role in promoting the engineering field and contribute in the development of the profession and the community;
6. Value the importance of the environment, both physical and natural, and work to promote sustainability principles;
7. Use techniques, skills and modern engineering tools necessary for engineering practice;
8. Assume full responsibility for own learning and self-development, engage in lifelong learning and demonstrate the capacity to engage in post- graduate and research studies;
9. Communicate effectively using different modes, tools and languages with various audiences; to deal with academic/professional challenges in a critical and creative manner;
10. Demonstrate leadership qualities, business administration and entrepreneurial skills.
11. Use appropriate specialized computer software, computational tools and packages.
12. Writing computer programs at professional levels that meet acceptable quality standards in the field of development Software
13. Preparing and displaying project diagrams and technical reports.
14. Professional integration of knowledge, engineering understanding and feedback to improve product and service design.
15. Create and re-design a component or system process and implement specialized engineering designs
16. Use techniques and skills in designing and implementing intelligent methods in different applications, such as computer vision, machine learning, mining big data, and speech processing.

7. Program Competencies

According to the National Academic Reference Standard, the program in Computer Systems Engineering must satisfy the following Competencies:

1- General Engineering NARS Competencies in 2018		
Level A (NARS)	A.1	Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.
	A.2	Develop and conduct appropriate experimentation and/or simulation, analyze and interpret data, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.
	A.3	Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the discipline and within the principles and contexts of sustainable design and development.
	A.4	Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.
	A.5	Practice research techniques and methods of investigation as an inherent part of learning.
	A.6	Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.
	A.7	Function efficiently as an individual and as a member of multi-disciplinary and multi- cultural teams.
	A.8	Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.
	A.9	Use creative, innovative and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.
	A.10	Acquire and apply new knowledge; and practice self, lifelong and other learning strategies.
2- Electrical NARS Competencies in 2018		
Level B (NARS)	B.1	Select, model and analyze electrical power systems applicable to the specific discipline by applying the concepts of: generation, transmission and distribution of electrical power systems.
	B.2	Design, model and analyze an electrical/electronic/digital system or component for a specific application; and identify the tools required to optimize this design.
	B.3	Design and implement: elements, modules, sub-systems or systems in electrical/electronic/digital engineering using technological and professional tools.
	B.4	Estimate and measure the performance of an electrical/electronic/digital system and circuit under specific input excitation, and evaluate its suitability for a specific application.
	B.5	Adopt suitable national and international standards and codes to: design, build, operate, inspect and maintain electrical/electronic/digital equipment, systems and services.
3- Computer Systems Engineering ARS		

Level C (ARS)	C.1	Apply the principles of computer programming, architecture, operating systems, networking, security, and embedded systems.
	C.2	Select and apply appropriate hardware and software tools, computing methods, design methodologies to develop computer systems.
	C.3	Design and implement intelligent methods in different applications, such as computer vision, machine learning, mining big data, speech and natural language processing.
	C.4	Adapt to evolving technologies and new trends in computer engineering profession.

To judge the compatibility of program objectives with its competencies, the following matrix is used:

Program Objectives	**Program Competencies**																		
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	C1	C2	C3	C4
Objective #1	√		√							√		√	√			√			√
Objective #2	√				√	√					√	√						√	√
Objective #3			√			√			√		√		√	√				√	
Objective #4	√				√									√	√	√			
Objective #5		√		√					√			√		√			√		
Objective #6		√	√							√	√	√					√		
Objective #7			√	√	√				√		√	√	√		√			√	√
Objective #8							√	√		√	√	√							√
Objective #9			√			√			√	√			√	√				√	√

PROGRAM REQUIREMENTS

Computer Systems Engineering Program Requirements

#	Requirements	Contact Hours	%	% according to reference framework
1	Humanities & Social Sciences	20	8	8-12
2	Mathematics & Basic Sciences	65	26	25-30
3	Basic Engineering Subjects	73	29	25-30
4	Applied Engineering and Design	67	27	25-30
5	Business Administration	8	3	2-4
6	Engineering Knowledge	9	4	3-6
7	Projects & Training	8	3	3-6
		250	100	100

#	Subjects	Contact Hours	%	Min. Percentage according to reference framework (%)
1	University Requirements	20	8	8
2	Faculty Requirements	70	28	20
3	Major Specialization Subjects	93	37	35
4	Minor Specialization Subjects	67	27	Maximum 30
		250	100	

LIST OF COURSES

COMPUTER SYSTEMS ENGINEERING PROGRAM

No.	Code	Course	Contact Hrs				Credit Hours
			Lec.	Tut.	Lab.	Total	Total
University Requirements (12+7+1=20 Contact Hours)= (12 Credit Hours)							
1	GEN0x0	Elective - Language requirements List	2	0	0	2	2
2	GEN011	Computer Skills	1	0	1	2	1
3	GEN012	History of Engineering & Technology	2	0	0	2	2
4	GEN9xx	Elective - University Requirements list	1	1	0	2	1
5	GEN9xx	Elective - University Requirements list	1	1	0	2	1
6	GEN9xx	Elective - University Requirements list	1	1	0	2	1
7	GEN9xx	Elective - University Requirements list	1	1	0	2	1
8	GEN9xx	Elective - University Requirements list	1	1	0	2	1
9	GEN9xx	Elective - University Requirements list	1	1	0	2	1
10	GEN9xx	Elective - University Requirements list	1	1	0	2	1
Faculty Requirements (25+ 23+22 =70 Contact Hours)= (43 Credit Hours)							
1	BAS010	Differential Calculus and Algebra	2	2	0	4	3
2	BAS011	Statics	2	1	2	5	3
3	BAS012	Engineering Chemistry	2	1	2	5	3
4	BAS013	Physics of Materials & Electricity	2	1	3	6	3
5	MEC010	Engineering Drawing (1)	0	3	0	3	1
5	MEC012	Engineering Drawing (2)	0	3	1	4	2
6	BAS014	Integral Calculus & Analytical Geometry	2	2	0	4	3
7	BAS015	Dynamics	2	1	2	5	3
8	BAS016	Physics of Light, Heat and Magnetism	2	1	2	5	3
9	MEC011	Principles of Manufacturing Engineering	1	0	2	3	2
10	BAS112	Differential Equations	2	2	0	4	3
11	BAS113	Special Functions and Transformations	2	2	0	4	3
12	ELE123	Technical Reports	2	0	0	2	2
13	BAS212	Partial Differential Equations and Numerical Analysis	2	2	0	4	3
14	BAS213	Statistics and Probability	2	2	0	4	3
15	ELE491	Graduation Project (1)	0	0	3	3	1
15	ELE492	Graduation Project (2)	0	0	5	5	2
00	ELE100	Summer Training (1)	0	0	0	0	0
00	ELE 200	Summer Training (2)	0	0	0	0	0
00	ELE300	Industrial Training (1)	0	0	0	0	0
00	ELE400	Industrial Training (2)	0	0	0	0	0
Major Specialization Subjects (40+27+26=93 Contact Hours) = (60 Credit Hours)							

1	ELE126	Mechanical and Civil Engineering	2	2	0	4	3
2	ELE125	Management of Engineering Projects	2	1	1	4	3
3	ELE121	Electrical Circuits	2	2	1	5	3
4	ELE122	Physics of Semiconductors	2	2	1	5	3
5	ELE124	Electronics (1)	2	2	1	5	3
6	ELE131	Computer Programming (1)	2	0	3	5	3
7	ELE132	Computer Programming (2)	2	0	3	5	3
8	ELE133	Design of Logic Circuits	2	2	1	5	3
9	ELE218	Engineering Economics	2	2	0	4	3
10	ELE241	Electrical Power Engineering	2	2	0	4	3
11	ELE221	Electronic Measurements	2	2	1	5	3
12	ELE222	Electrical and Magnetic Fields	2	2	1	5	3
13	ELE224	Signal Analysis and Systems	2	2	1	5	3
14	ELE225	Electronics (2)	2	2	1	5	3
15	ELE231	Web Programming	2	0	3	5	3
16	ELE232	Computer Organization	2	2	1	5	3
17	ELE321	Communication Systems	2	0	3	5	3
18	ELE324	Digital Signal Processing	2	0	2	4	3
19	ELE334	Embedded Systems	2	0	2	4	3
20	ELE343	Electrical Machines and Control	2	2	0	4	3
Minor Specialization Subjects (28+0+39=67 Contact Hours) = (42 Credit Hours)							
1	ELE331	Algorithms and Data Structure	2	0	3	5	3
2	ELE333	Database Design	2	0	3	5	3
3	ELE335	Artificial Intelligence	2	0	3	5	3
4	ELE336	Computer Architecture	2	0	3	5	3
5	ELE337	Systems Analysis and Design	2	0	3	5	3
6	ELE338	Information Security	2	0	2	4	3
7	ELE431	Operating Systems	2	0	3	5	3
8	ELE432	Machine Learning	2	0	3	5	3
9	ELE433	High Performance Computing	2	0	2	4	3
10	ELE434	Compilers	2	0	2	4	3
11	ELE4XX	Elective Course (1)	2	0	3	5	3
12	ELE4XX	Elective Course (2)	2	0	3	5	3
13	ELE4XX	Elective Course (3)	2	0	3	5	3
14	ELE4XX	Elective Course (4)	2	0	3	5	3

COURSES CLASSIFICATION
COMPUTER SYSTEMS ENGINEERING PROGRAM

No.	Code	Course	Contact Hrs			
			Lec.	Tut.	Lab.	Total
Humanities & Social Science Subjects (20 Contact Hours)						
1	GEN0x0	Elective - Language requirements List	2	0	0	2
2	GEN011	Computer Skills	1	0	1	2
3	GEN012	History of Engineering & Technology	2	0	0	2
4	GEN9xx	Elective - University Requirements list	1	1	0	2
5	GEN9xx	Elective - University Requirements list	1	1	0	2
6	GEN9xx	Elective - University Requirements list	1	1	0	2
7	GEN9xx	Elective - University Requirements list	1	1	0	2
8	GEN9xx	Elective - University Requirements list	1	1	0	2
9	GEN9xx	Elective - University Requirements list	1	1	0	2
10	GEN9xx	Elective - University Requirements list	1	1	0	2
Business Administration (8 Contact Hours)						
1	ELE125	Management of Engineering Projects	2	1	1	4
2	ELE218	Engineering Economics	2	2	0	4
Mathematics & Basic Sciences (65 Contact Hours)						
1	BAS010	Differential Calculus and Algebra	2	2	0	4
2	BAS011	Statics	2	1	2	5
3	BAS012	Engineering Chemistry	2	1	2	5
4	BAS013	Physics of Materials & Electricity	2	1	3	6
5	BAS014	Integral Calculus & Analytical Geometry	2	2	0	4
6	BAS015	Dynamics	2	1	2	5
7	BAS016	Physics of Light, Heat and Magnetism	2	1	2	5
8	BAS112	Differential Equations	2	2	0	4
9	BAS212	Partial Differential Equations and Numerical Analysis	2	2	0	4
10	BAS213	Statistics and Probability	2	2	0	4
11	BAS113	Special Functions and Transformations	2	2	0	4
12	ELE122	Physics of Semiconductors	2	2	1	5
13	ELE222	Electrical and Magnetic Fields	2	2	1	5
14	ELE331	Algorithms and Data Structure	2	0	3	5
Engineering Knowledge Subjects (9 Contact Hours)						
1	MEC011	Principles of Manufacturing Engineering	1	0	2	3
2	ELE126	Mechanical and Civil Engineering	2	2	0	4
3	ELE123	Technical Reports	2	0	0	2
Basic Engineering Science Subjects (73 Contact Hours)						
1	MEC010	Engineering Drawing (1)	0	3	0	3
2	MEC012	Engineering Drawing (2)	0	3	1	4
3	ELE121	Electrical Circuits	2	2	1	5
4	ELE124	Electronics (1)	2	2	1	5
5	ELE131	Computer Programming (1)	2	0	3	5
6	ELE132	Computer Programming (2)	2	0	3	5
7	ELE221	Electronic Measurements	2	2	1	5
8	ELE224	Signal Analysis and Systems	2	2	1	5
9	ELE225	Electronics (2)	2	2	1	5

10	ELE231	Web Programming	2	0	3	5
11	ELE232	Computer Organization	2	2	1	5
12	ELE241	Electrical Power Engineering	2	2	0	4
13	ELE133	Design of Logic Circuits	2	2	1	5
14	ELE324	Digital Signal Processing	2	0	2	4
15	ELE334	Embedded Systems	2	0	2	4
16	ELE343	Electrical Machines and Control	2	2	0	4
Applied Engineering and Design Subjects (67 Contact Hours)						
1	ELE322	Computer Networks	2	0	3	5
2	ELE333	Database Design	2	0	3	5
3	ELE335	Artificial Intelligence	2	0	3	5
4	ELE336	Computer Architecture	2	0	3	5
5	ELE337	Systems Analysis and Design	2	0	3	5
6	ELE338	Information Security	2	0	2	4
7	ELE431	Operating Systems	2	0	3	5
8	ELE432	Machine Learning	2	0	3	5
9	ELE433	High Performance Computing	2	0	2	4
10	ELE434	Compilers	2	0	2	4
11	ELE4XX	Elective Course (1)	2	0	3	5
12	ELE4XX	Elective Course (2)	2	0	3	5
13	ELE4XX	Elective Course (3)	2	0	3	5
14	ELE4XX	Elective Course (4)	2	0	3	5
Projects and Field Training Subjects (8 Contact Hours)						
1	ELE491	Graduation Project (1)	0	0	3	3
2	ELE492	Graduation Project (2)	0	0	5	5
3	ELE100	Summer Training (1)	0	0	0	0
4	ELE 200	Summer Training (2)	0	0	0	0
5	ELE 300	Field Training (1)	0	0	0	0
6	ELE 400	Field Training (2)	0	0	0	0

STUDY PLAN

PREPARATORY YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
BAS010	Differential Calculus and Algebra	2	2	0	4	60	0	60	120	3
BAS011	Statics	2	1	2	5	45	30	75	150	3
BAS012	Engineering Chemistry	2	1	2	5	45	30	75	150	3
BAS013	Physics of Materials & Electricity	2	1	3	6	45	45	90	180	3
MEC010	Engineering Drawing (1) ×	0	3	0	3	25	20	45	90	3
GEN0x0	Elective - Language requirements List	2	0	0	2	30	0	30	60	2
		10	**8**	**7**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
BAS014	Integral Calculus & Analytical Geometry	2	2	0	4	60	0	60	120	3
BAS015	Dynamics	2	1	2	5	45	30	75	150	3
BAS016	Physics of Light, Heat and Magnetism	2	1	2	5	45	30	75	150	3
MEC011	Principles of Manufacturing Engineering†	1	0	2	3	25	20	45	90	3
MEC012	Engineering Drawing (2) ×	0	3	1	4	30	30	60	120	3
GEN011	Computer Skills ×	1	0	1	2	15	15	30	60	2
GEN012	History of Engineering & Technology	2	0	0	2	30	0	30	60	2
		10	**7**	**8**	**25**				**750**	

† In workshops, students are divided into groups 15 students/each, and a faculty stuff member (or an assistant) as well as a practical trainer will teach the group.

× In exercises, students are divided into groups 15 students/each. Two faculty stuff members or their assistants will teach each group.

FIRST YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
BAS112	Differential Equations	2	2	0	4	60	0	60	120	3
ELE121	Electrical Circuits *	2	2	1	5	50	25	75	150	3
ELE122	Physics of Semiconductors	2	2	1	5	50	25	75	150	3
ELE131	Computer Programming (1)	2	0	3	5	50	25	75	150	3
ELE126	Mechanical and Civil Engineering	2	2	0	4	30	30	60	120	3
ELE123	Technical Reports	2	0	0	2	30	0	30	60	2
		12	**8**	**5**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
BAS113	Special Functions and Transformations	2	2	0	4	60	0	60	120	3
ELE124	Electronics (1)	2	2	1	5	50	25	75	150	3
ELE125	Management of Engineering Projects	2	1	1	4	30	30	60	120	2
ELE132	Computer Programming (2)	2	0	3	5	50	25	75	150	3
ELE133	Design of Logic Circuits	2	2	1	5	50	25	75	150	3
GEN9xx	Elective - University Requirements list	1	1	0	2	20	10	30	60	2
		11	**8**	**6**	**25**				**750**	

* Prior to registering in first year, the student should have completed 3 weeks of summer training (1) (ELE100) for 3 weeks in summer, 5 days per week. The daily training is for 5 hours (2 hrs Lecture + 3 hrs tutorial), amounting to a total of 25 hours per week. A maximum grade of 25 marks is added to the 'semester work' grades of the “electrical circuits” course (ELE121).

SECOND YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
BAS212	Partial Differential Eqs. & Numerical Analysis	2	2	0	4	60	0	60	120	3
ELE221	Electronic Measurements *	2	2	1	5	50	25	75	150	3
ELE222	Electrical and Magnetic Fields	2	2	1	5	50	25	75	150	3
ELE231	Web Programming	2	0	3	5	50	25	75	150	3
ELE241	Electrical Power Engineering	2	2	0	4	30	30	60	120	3
GEN9xx	Elective - University Requirements list	1	1	0	2	20	10	30	60	2
		11	**9**	**5**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
BAS213	Statistics and Probability	2	2	0	4	60	0	60	120	3
ELE218	Engineering Economics	2	2	0	4	60	0	60	120	2
ELE224	Signal Analysis and Systems	2	2	1	5	50	25	75	150	3
ELE225	Electronics (2)	2	2	1	5	50	25	75	150	3
ELE232	Computer Organization	2	2	1	5	50	25	75	150	3
GEN9xx	Elective - University Requirements list	1	1	0	2	20	10	30	50	2
		11	**11**	**3**	**25**				**750**	

* After completing the first year, the student should have completed 3 weeks of summer training (2) (ELE200) for 3 weeks in summer, 5 days per week. The daily training is for 5 hours (2 hrs Lecture + 3 hrs tutorial), amounting to a total of 25 hours per week. A maximum grade of 25 marks is added to the 'semester work' grades of the "Electronic Measurements" course (ELE221).

THIRD YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
ELE322	Computer Networks	2	0	3	5	30	30	60	120	3
ELE331	Algorithms and Data Structure	2	0	3	5	50	25	75	150	3
ELE333	Database Design	2	0	3	5	50	25	75	150	3
ELE334	Embedded Systems	2	0	2	4	30	30	60	120	3
ELE343	Electrical Machines and Control	2	2	0	4	30	30	60	120	3
GEN9xx	Elective - University Requirements list	1	1	0	2	20	10	30	60	2
ELE300	Field Training (1) *	0	0	0	0	15	15	0	30	0
		11	**3**	**11**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
ELE324	Digital Signal Processing	2	0	2	4	30	30	60	120	3
ELE335	Artificial Intelligence	2	0	3	5	50	25	75	150	3
ELE336	Computer Architecture	2	0	3	5	50	25	75	150	3
ELE337	Systems Analysis and Design	2	0	3	5	50	25	75	150	3
ELE338	Information Security	2	0	2	4	30	30	60	120	3
GEN9xx	Elective - University Requirements list	1	1	0	2	20	10	30	60	2
		11	**1**	**13**	**25**				**750**	

* After completing the second year, the student undergoes field training (1) (ELE300) for 4 weeks during the summer vacation, in a factory, company, firm or project site …etc in a related field. Every 5 students are supervised by a staff member of the department, (this supervision is not included in the staff member's teaching load).

FOURTH YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
ELE431	Operating Systems	2	0	3	5	30	30	60	120	3
ELE432	Machine Learning	2	0	3	5	50	25	75	150	3
ELE4XX	Elective Course (1)	2	0	3	5	50	25	75	150	3
ELE4XX	Elective Course (2)	2	0	3	5	50	25	75	150	3
GEN9xx	Elective - University Requirements list	1	1	0	2	20	10	30	60	2
ELE491	Graduation Project (1)	0	0	3	3	50	40	0	90	-
ELE 400	Field Training (2) *	0	0	0	0	15	15	0	30	0
		9	**1**	**15**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
ELE433	High Performance Computing	2	0	2	4	30	30	60	120	3
ELE434	Compilers	2	0	2	4	30	30	60	120	3
ELE4XX	Elective Course (3)	2	0	3	5	50	25	75	150	3
ELE4XX	Elective Course (4)	2	0	3	5	50	25	75	150	3
GEN9xx	Elective - University Requirements list	1	1	0	2	20	10	30	60	2
ELE492	Graduation Project (2) **	0	0	5	5	30	120	0	150	-
		9	**1**	**15**	**25**				**750**	

* After completing the third year, the student undergoes field training (2) (ELE400) for 4 weeks during the summer vacation, in a factory, company, firm or project site ...etc in a related field. Every 5 students are supervised by a staff member of the department, (this supervision is not included in the staff member's teaching load).

** After completing the second semester, the students are divided into groups and continue performing the graduation project for 4 weeks.

LIST OF TECHNICAL LANGUAGES ELECTIVE COURSES

#	Code	Contact Hours	Contact Hrs			
			Lec.	Tut.	Lab.	Total
1	GEN010	English Language	2	0	0	2
2	GEN020	German Language	2	0	0	2
3	GEN030	French Language	2	0	0	2

LIST OF UNIVERSITY REQUIREMENTS ELECTIVE COURSES

#	Code	Contact Hours	Contact Hrs			
			Lec.	Tut.	Lab.	Total
1	GEN900	Communication & Presentation Skills	1	1	0	2
2	GEN901	Theory of Sustainability	1	1	0	2
3	GEN902	Human Rights and Combating Corruption	1	1	0	2
4	GEN903	Research & Analysis Skills	1	1	0	2
5	GEN904	Entrepreneurship	1	1	0	2
6	GEN905	Professional Ethics	1	1	0	2
7	GEN906	Critical Thinking	1	1	0	2
8	GEN907	Human Resources Management	1	1	0	2
9	GEN908	Contracts and Legislation	1	1	0	2
10	GEN909	Method of Scientific Research and Writing	1	1	0	2

LIST OF ELECTIVE COURSES FOR COMPUTER SYSTEMS ENGINEERING

#	Code	Contact Hours	Contact Hrs			
			Lec.	Tut.	Lab.	Total
1	ELE435	Neural Networks	2	0	3	5
2	ELE436	Computer Graphics	2	0	3	5
3	ELE437	Image Processing	2	0	3	5
4	ELE438	Speech Processing	2	0	3	5
5	ELE439	Distributed Systems	2	0	3	5
6	ELE461	Data Mining	2	0	3	5
7	ELE462	Computer Vision	2	0	3	5
8	ELE463	Robotics Engineering	2	0	3	5
9	ELE464	Big Data Analysis	2	0	3	5
10	ELE465	Internet of Things	2	0	3	5
11	ELE466	Software Engineering	2	0	3	5
12	ELE467	Selected Topics in Computer Engineering	2	0	3	5

COMPUTER SYSTEMS ENGINEERING PROGRAM TREE

	First Semester						Second Semester					
Elective Courses	ELE435 **Neural Networks**	ELE436 **Computer Graphics**	ELE437 **Image Processing**	ELE438 **Speech Processing**	ELE439 **Distributed Systems**	ELE461 **Data Mining**	ELE462 **Computer Vision**	ELE463 **Robotics Engineering**	ELE464 **Big Data Analysis**	ELE4645 **Internet of Things**	ELE466 **Software Engineering**	ELE467 **Selected Topics in Computer Engineering**
Prerequisite	ELE335 **Artificial Intelligence**	ELE331 **Algorithms and Data Structure**	ELE324 **Digital Signal Processing**	ELE324 **Digital Signal Processing**	ELE336 **Computer Architecture**	ELE331 **Algorithms and Data Structure**	ELE324 **Digital Signal Processing**	ELE335 **Artificial Intelligence**	ELE331 **Algorithms and Data Structure**	ELE334 **Embedded Systems**	ELE333 **Database Design**	ELE335 **Artificial Intelligence**

FOURTH YEAR	ELE431 **Operating Systems**	ELE432 **Machine Learning**	ELE4XX **Elective Course (1)**	ELE4XX **Elective Course (2)**	GEN9XX **Univ. Req. Elective**	ELE491 **Graduation Project (1)**	ELE433 **High Performance Computing**	ELE434 **Compilers**	ELE4XX **Elective Course (3)**	ELE4XX **Elective Course (4)**	GEN9XX **Univ. Req. Elective**	ELE492 **Graduation Project (2) ***
Prerequisite	ELE232 **Computer Organization**	ELE335 **Artificial Intelligence**					ELE336 **Computer Architecture**	ELE336 **Computer Architecture**				

BENHA UNIVERSITY

COMPUTER SYSTEMS ENGINEERING PROGRAM (2021)

FACULTY OF ENGINEERING AT SHOUBRA

THIRD YEAR	ELE331 **Algorithms and Data Structure**	ELE322 **Computer Networks**	ELE333 **Database Design**	ELE334 **Embedded Systems**	ELE343 **Electrical Machines and Control**	GEN9XX **Univ. Req. Elective**	ELE300 **Field Training (2)**	ELE335 **Artificial Intelligence**	ELE336 **Computer Architecture**	ELE337 **Systems Analysis and Design**	ELE324 **Digital Signal Processing**	ELE338 **Information Security**	GEN9XX **Univ. Req. Elective**
Prerequisite	ELE132 **Computer Programming (2)**	ELE133 **Design of Logic Circuits**	ELE132 **Computer Programming (2)**	ELE232 **Computer Organization**	ELE222 **Electrical and Magnetic Fields**			ELE132 **Computer Programming (2)**	ELE232 **Computer Organization**	ELE333 **Database Design**	ELE224 **Signal Analysis and Systems**	ELE331 **Algorithms and Data Structure**	

SECOND YEAR	ELE221 **Electronic Measurem ents**	ELE222 **Electrical and Magnetic Fields**	ELE231 **Web Programming**	ELE241 **Electrical Power Engineering**	BAS212 **Partial Differential Eqs. & Numerical Analysis**	GEN9XX **Univ. Req. Elective**	ELE200 **Field Training (1)**	ELE224 **Signal Analysis and Systems**	ELE232 **Computer Organization**	ELE225 **Electronics (2)**	BAS213 **Statistics and Probability**	ELE226 **Engineering Economics**	GEN9XX **Univ. Req. Elective**
Prerequisite	ELE124 **Electronics (1)**	BAS 016 **Physics of Light, Heat and Magnetism**	ELE132 **Computer Programming (2)**	ELE121 **Electrical Circuits**	BAS112 **Differential Equations**			BAS113 **Special Functions and Transformations**	ELE133 **Design of Logic Circuits**	ELE124 **Electronics (1)**	BAS 014 **Integral Calculus & Analytical Geometry**		

BENHA UNIVERSITY

COMPUTER SYSTEMS ENGINEERING PROGRAM (2021)

FACULTY OF ENGINEERING AT SHOUBRA

FIRST YEAR	BAS112 **Differential Equations**	ELE126 **Mechanical and Civil Engineering**	ELE121 **Electrical Circuits**	ELE131 **Computer Programming (1)**	ELE122 **Physics of Semiconductors**	ELE123 **Technical Reports**	BAS113 **Special Functions and Transformations**	ELE132 **Computer Programming (2)**	ELE124 **Electronics (1)**	ELE125 **Management of Engineering Projects**	ELE133 **Design of Logic Circuits**	GEN9XX **Univ. Req. Elective**
Prerequisite	BAS 014 **Integral Calculus & Analytical Geometry**		BAS013 **Physics of Materials & Electricity**	GEN011 **Computer Skills**	BAS013 **Physics of Materials & Electricity**		BAS112 **Differential Equations**	GEN011 **Computer Skills**	ELE122 **Physics of Semiconducto rs**		GEN011 **Computer Skills**	GEN011 **Computer Skills**

Prep. YEAR	BAS010 **Differential Calculus and Algebra**	BAS011 **Statics**	BAS012 **Engineering Chemistry**	BAS013 **Physics of Materials & Electricity**	MEC010 **Engineering Drawing (1)**	GEN0X0 **Technical Language Elective**	BAS 014 **Integral Calculus & Analytical Geometry**	BAS 015 **Dynamics**	BAS 016 **Physics of Light, Heat and Magnetism**	MEC011 **Principles of Manufacturin g Engineering**	MEC012 **Engineering Drawing (2)**	GEN011 **Computer Skills**	GEN112 **History of Engineering & Technology**
Prerequisite							BAS010 **Differential Calculus and Algebra**	BAS011 **Statics**	BAS013 **Physics of Materials & Electricity**				

Matrix relating the program courses with competencies

Course Code	Course Name	Engineering Competencies (2018)										Electrical Engineering Competencies (NARS)					Computer Systems Engineering Competencies (ARS)			
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	C1	C2	C3	C4
BAS010	Differential Calculus and Algebra	√							√			√								
BAS011	Statics	√							√											
BAS012	Engineering Chemistry	√							√											
BAS013	Physics of Materials & Electricity	√							√											
MEC010	Engineering Drawing (1)	√					√		√											
GEN010	Technical Language	√	√						√	√										
BAS014	Integral Calculus & Analytical Geometry	√							√			√								
BAS015	Dynamics	√							√											
BAS016	Physics of Light, Heat and Magnetism	√							√											
MEC011	Principles of Manufacturing Engineering	√	√				√		√		√									
MEC012	Engineering Drawing (2)	√			√				√											

Course Code	Course Name	Engineering Competencies (2018)										Electrical Engineering Competencies (NARS)					Computer Systems Engineering Competencies (ARS)			
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	C1	C2	C3	C4
GEN011	Computer Skills	√	√						√		√		√		√					
GEN012	History of Engineering & Technology	√		√					√	√										
BAS112	Differential Equations	✓							✓											
ELE121	Electrical Circuits *	✓	✓			✓			√			✓	✓							
ELE122	Physics of Semiconductors	√	√				√		√		√									
ELE131	Computer Programming (1)	✓			✓		✓	✓		✓	✓			✓		✓	✓	✓		
ELE126	Mechanical and Civil Engineering	✓			✓	✓														
ELE123	Technical Reports					√	√		✓											
BAS113	Special Functions and Transformations	✓							✓											
ELE124	Electronics (1)	✓	✓			✓			✓				✓	✓	✓					
ELE125	Management of Engineering Projects	✓		✓			✓	✓	✓	✓										
ELE132	Computer Programming (2)	✓	✓	✓	✓	✓	✓	✓					✓	✓		✓	✓	✓		
ELE133	Design of Logic Circuits	✓	✓	✓		✓		✓			✓	✓	✓					✓		✓
GEN110	Communication and Presentation Skills	✓		✓						✓	✓	✓								
BAS212	Partial Differential Eqs. & Numerical Analysis	✓							✓											
ELE221	Electronic Measurements *	√	√				√		√				√		√		√			
ELE222	Electrical and Magnetic Fields	✓				✓			✓						✓					
ELE231	Web Programming		✓	✓		✓	✓			✓				✓	✓					

Course Code	Course Name	Engineering Competencies (2018)										Electrical Engineering Competencies (NARS)					Computer Systems Engineering Competencies (ARS)			
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	C1	C2	C3	C4
ELE241	Electrical Power Engineering	✓	✓								✓		✓		✓					
GEN210	Human Rights and Anti-Corruption	✓		✓						✓	✓	✓								
BAS213	Statistics and Probability	✓							✓											
ELE218	Engineering Economics	✓		✓						✓	✓	✓								
ELE224	Signal Analysis and Systems	✓	✓										✓	✓	✓					✓
ELE225	Electronics (2)	✓	✓	✓									✓	✓	✓	✓				
ELE232	Computer Organization	✓	✓			✓					✓	✓			✓					
GEN211	Analysis and Research Skills	✓		✓						✓	✓	✓								
ELE322	Computer Networks		✓	✓				✓					✓	✓	✓	✓	✓		✓	
ELE331	Algorithms and Data Structure	✓	✓	✓	✓							✓	✓		✓		✓	✓		
ELE333	Database Design		✓	✓			✓						✓	✓				✓		
ELE334	Embedded Systems		✓							✓			✓				✓			
ELE343	Electrical Machines and Control	✓	✓						✓		✓		✓		✓					
GEN310	Entrepreneurship	✓		✓						✓	✓	✓								
ELE300	Field Training (1) *		✓		✓			✓						✓	✓		✓			✓
ELE324	Digital Signal Processing	✓	✓							✓	✓	✓								✓
ELE335	Artificial Intelligence					✓	✓	✓	✓	✓	✓		✓	✓	✓				✓	✓
ELE336	Computer Architecture		✓			✓			✓		✓				✓			✓		
ELE337	Systems Analysis and Design		✓	✓			✓						✓	✓				✓		
ELE338	Information Security	✓			✓	✓		✓	✓					✓	✓	✓	✓	✓		✓

Course Code	Course Name	Engineering Competencies (2018)										Electrical Engineering Competencies (NARS)					Computer Systems Engineering Competencies (ARS)			
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	C1	C2	C3	C4
GEN311	Professional Ethics	✓		✓						✓	✓	✓								
ELE431	Operating Systems		✓			✓	✓		✓		✓			✓	✓		✓	✓		✓
ELE432	Machine Learning	✓	✓						✓		✓		✓	✓					✓	✓
GEN410	Critical Thinking	✓		✓						✓	✓	✓								
ELE491	Graduation Project (1)		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
ELE 400	Field Training (2) *		✓		✓			✓						✓	✓		✓			✓
ELE433	High Performance Computing		✓			✓			✓		✓				✓			✓		
ELE434	Compilers					✓	✓		✓		✓			✓			✓	✓		✓
GEN411	Human Resources Management	✓		✓						✓	✓	✓								
ELE492	Graduation Project (2) **		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
ELE435	Neural Networks	✓	✓						✓		✓		✓	✓					✓	
ELE436	Computer Graphics	✓	✓			✓		✓	✓		✓	✓	✓	✓				✓	✓	✓
ELE437	Image Processing	✓	✓			✓					✓		✓	✓				✓	✓	
ELE438	Speech Processing		✓			✓							✓	✓				✓	✓	
ELE439	Distributed Systems		✓			✓			✓		✓				✓			✓		
ELE461	Data Mining		✓						✓		✓		✓	✓					✓	✓
ELE462	Computer Vision	✓	✓			✓					✓		✓	✓				✓	✓	
ELE463	Robotics Engineering	✓		✓	✓		✓						✓	✓	✓			✓		✓

Course Code	Course Name	Engineering Competencies (2018)										Electrical Engineering Competencies (NARS)					Computer Systems Engineering Competencies (ARS)			
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	C1	C2	C3	C4
ELE464	Big Data Analysis	✓	✓						✓		✓		✓	✓					✓	✓
ELE465	Internet of Things		✓							✓			✓				✓			
ELE466	Software Engineering		✓	✓			✓							✓		✓			✓	
ELE467	Selected Topics in Computer Engineering	✓	✓			✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓		✓

Courses Description

PREPARATORY YEAR

BAS010 Differential Calculus and Algebra (2,2,0)

Differentiation: Elementary functions, Polynomials, Exponential, Logarithmic and trigonometric functions, Limits and continuity, Derivative, Implicit differentiation, Maximum and minimum values, Mean value theorem, Taylor's expansion, Integration of Polynomials, Exponential and trigonometric functions, Definite integral.

Algebra: Matrices, Algebra of matrices, Eigenvalues and eigenvectors, Positive and negative matrices, Linear systems, Finite series, Complex numbers, Mathematical induction.

References:

1- Basic Technical Mathematics with Calculus Kindle Edition, Pearson; 11th Edition, 2017.
2- Textbook of Basic Mathematics: A Begginer's Guide To Geometry, Trigonometry and Calculus Kindle Edition, , 2017.

BAS011 Statics (2,1,2)

Application on space vectors, resultant of a set of forces, moments, equivalent couple moment, equations of equilibrium for rigid body, types of supports, statically determinate beams and trusses, equilibrium under influence of spatial forces and couples, center of mass (for particles and planer surface), moment of inertia (parallel axes, major axes, planer surface).

References:

1- Engineering Mechanics: Statics & Dynamics by Russell Hibbeler, Pearson; 14th Edition, 2015.

BAS012 Engineering Chemistry (2,1,2)

Gaseous state (gases law), chemical equilibrium and Le Chatellier, principle –solutions- phase diagram- basics of water treatment and desalination technology- Introduction on thermo chemistry and its rules, basics of fuel combustion, calorimetric and determination of heat of combustion –Electrochemistry and conduction in electrolytic solutions Electrochemical cells and Nernst equation- Corrosion of metals (types, methods of prevention of corrosion – ionic equilibrium and pH calculation- building materials and some petrochemicals industry.

References:

1- Engineering Chemistry: Alpha Science; Illustrated Edition, 2018

BAS013 Physics of Materials & Electricity (2,1,3)

Properties of matter : Physical quantities, standard units and dimensions, atomic structure (electronic distribution, classification of elements and energy levels), crystalline structure (crystalline grid, symmetry, vacuum groups, some simple examples of crystalline structure), stress and strain, mechanical properties of materials (tensile strength and yield stress, etc.,) Physical properties of liquids, viscosity, surface tension, Archimedes principles, Pascal's law, Bernoull's equation and their applications. Laboratory experiments. Electrical: charge and matter, Coulomb's law, electric field, Gauss's law, electric potential, capacitors and dielectric materials, electrical resistance and electromotive force, Ohm's law, simple electrical circuit, laboratory experiments.

References:

1- Modern Classical Physics: Optics, Fluids, Plasmas, Elasticity, Relativity, and Statistical Physics by Kip S. Thorne , Princeton University Press, 2017.
2- Basic Physics: A Self-Teaching Guide by K Kuhn, Noah Books, 2018

BAS014 Integral Calculus and Analytical Geometry (2,2,0)

Integration: Hyperbolic functions and inverse functions and their derivatives, derivatives of parametric relations, Methods of integrations, integration by partial fractions, parts, reduction and substitution, Applications of definite integrals for obtaining plane area, volumes, arc length and surface area.

Analytical geometry: Cartesian and polar coordinates, Equation of pair of lines, Equation of circle, Conic sections and their properties, Equation of plane, Equations of sphere, cone and cylinder.

References:

1- Basic Technical Mathematics with Calculus Kindle Edition, Pearson; 11th Edition, 2017.
2- Textbook of Basic Mathematics: A Begginer's Guide To Geometry, Trigonometry and Calculus Kindle Edition, , 2017.

BAS015 Dynamics (2,1,2)

Kinematics of Particle (rectilinear and curvilinear motion, Cartesian coordinates, projectile motion, natural coordinates, polar coordinates, relative motion), kinetics of Particle (acceleration force method), plane kinematics of rigid bodies (translational and rotational motion, general motion: relative velocities, instantaneous center of zero velocity, planer kinetics of rigid body, acceleration forces, work and energy, impact and momentum.

References:

1- Engineering Mechanics: Statics & Dynamics by Russell Hibbeler, Pearson; 14th Edition, 2015.

BAS016 Physics of Light, Heat and Magnetism (2,1,2)

Principles of heat and thermodynamics: Zero law, first and second Law of thermodynamics, heat transfer, gas theory, temperature measurement methods. Light and laser physics: general concepts of light, straight diffusion of light, Velocity of light diffusion, light beam, optical beams, geometric light, reflection and refraction, wave radiation modeling, wave dissipation, diffraction of light, introduction to lasers, Einstein's equations and magnification Light, Explanation of some lasers (gas, solid and liquid lasers), laser applications. Magnetism: magnetic field, Faraday magnetic law, magnetic induction, Boit-savart's law, Ampere's law, laboratory experiments.

References:

1- Modern Classical Physics: Optics, Fluids, Plasmas, Elasticity, Relativity, and Statistical Physics by Kip S. Thorne , Princeton University Press, 2017.
2- Basic Physics: A Self-Teaching Guide by K Kuhn, Noah Books, 2018

MEC010 Engineering Drawing (1) (0,3,0)

This is an introductory course teaches the basics of technical Drawing using manual drafting instruments. The topics include drawing tools, types of lines, sizes and layout of standard drawing sheets, lettering & numbering, scale use, drawing of geometrical figures, dimensioning, axonometric and isometric views, orthogonal and auxiliary projections, drawing of orthographic projection from isometric view.

References:

1- A Textbook of Engineering Drawing: Along with an Introduction to AutoCAD 2015 by Roop Lal, I K International Publishing House, 2015.

MEC011 Principles of Manufacturing Engineering (1,0,2)

The course introduces the basic concepts of production and productivity. The topics include classification of production processes, industrial safety, engineering materials, ferrous and non-ferrous alloys, steel and its types, cast iron and its types, steel and cast iron production, metal casting processes (sand casting, mold casting, centrifugal casting, wax casting, hot and cold metal forming processes (extrusion, forging, rolling, deep drawing, wire drawing, etc.), metal cutting processes (turning, milling, shaping, drilling, grinding, etc.), metal joining

techniques (welding processes, rivets, bolts … etc). Simple workshop measuring tools (Vernier caliper, micrometers, etc.), practical skills in workshops.

References:

1- Workshop Technology (Manufacturing Process) by S. K. Garg, Laxmi Publications; 3rd Revised edition, 2009.

MEC012 Engineering Drawing (2) (0,3,1)

Deduction of the missing orthogonal views, sections in machine members, hatching rules, intersections of solids and surfaces, development of surfaces, drawing of steel structures. Basics of computer aided drafting (CAD) using AutoCAD: Workspace, toolbars, coordinate systems, setting up 2D drawing environment, drawing tools in AutoCAD, object snap, modification tools in AutoCAD, texting and dimensioning in AutoCAD.

References:

1- A Textbook of Engineering Drawing: Along with an Introduction to AutoCAD 2015 by Roop Lal, I K International Publishing House, 2015.

FIRST YEAR

BAS112 Differential Equations (2,2,0)

Functions of several variables, Partial differentiation, Maximum and minimum values, Conditional extrema, Curvature, Double and triple integrals, Line integral, Ordinary differential equations, first order and higher order, Linear Systems of ordinary differential equations, Vectors analysis, Gradient, Laplace transformations, Inverse Laplace transformations.

References:

1- Differential Equations and Linear Algebra (Gilbert Strang), Wellesley-Cambridge; UK ed. Edition,2014.
2- Elementary Differential Equations and Boundary Value Problems by William E. Boyce et al., Wiley; 11th Edition, 2017.

BAS113 Special Functions and Transformations (2,2,0)

Periodic functions, Fourier series, Fourier integrals, Special functions, Gamma, Beta, Green function, Bessel functions, Z-transform, Inverse Z-transform, Integral equations.

References:

1- K. A. Stroud, Engineering Mathematics, Fifth Edition, Industrial Press Inc., New York. 2001.
2- E. Kreyszig, Advanced Engineering Mathematics, John Wiley and Sons, New York 1999.

ELE121 Electrical Circuits (2,2,1)

Basic DC circuit elements, series and parallel network, Ohm’s law and 1st and 2nd Kirchoff’s laws, Nodal analysis, Mesh analysis, Basic network theorems (source transformation, super position theorem, Thevenin’s theorem, Norton’s theorem, maximum power transfer, Time response of R-L and R-C circuits).

Practical part: Use of ammeters, voltmeters and function generators - Ohm's law - Series and parallel connections of resistors Voltage divider under load and no-load - Capacitor in a DC circuit - Relay circuit - Capacitor in an AC circuit - Coil in an AC circuit - Series and parallel connections of R , L and C- Resonance. Use of Function generators -Diode in the DC and AC circuit - Half-wave and bridge rectifiers - Zener diode.

References:

1. "Electric Circuit Fundamentals", Thomas l. Floyed ,9th Edition, Prentice Hall, 2009.

2. "Fundamentals of Electric Circuits", Charles Alexander, Matthew Sadiku, McGraw-Hill Education; 7th Edition, 2020.
3. ELO Training Kit Course for AC

ELE122 Physics of Semiconductors (2,2,1)

Basics of semiconductor physics–Fermi-Dirac distribution–Carriers concentrations–Intrinsic and Extrinsic materials–Charge neutrality–Currents in Semiconductors (drift current - diffusion current)–Semiconductor parameters (mobility, Scattering, life-time)–Hall effect–PN junction theory–Diode IV characteristics–Special purpose diodes (Light emitting diodes, photo diodes, Zener diode and LASER diodes) –Theory of operation and basics of Bipolar junction transistors. Basic DC analysis of the (BJT) and Biasing Techniques for the different amplifier configurations.

References:

1- Microelectronic circuits, Adel Sedra and Kenneth Smith, 8th Edition, 2020.
2- Electronics Principles by Albert Malvino and David J. Bates,2007.

ELE126 Mechanical and Civil Engineering (2,2,0)

Mechanical Eng.: The first law of thermodynamics - The second law of thermodynamics - Thermal machines - Inverted thermal machines - Entropy - Ideal gases and real gases - Reflex and non-reflexive procedures - Carnot cycle. Basic concepts of fluids - Fluid statics - Fluid flow characterization - Basic equations - Bernoulli's equation - Different applications on the equations of movement and Bernoulli's quantity - Flow in pipes and tubes .

Civil Eng.: An Overview of the Building Delivery Process, Loads on Buildings, Load Resistance—The Structural Properties of Materials, Structural systems, Thermal Properties of Materials, Fire - Related Properties, Principles of Sustainable Construction. Materials and systems of construction: The Material Steel and Structural Steel Construction, Lime, Portland Cement and Concrete, Concrete Construction, Soils; Foundation and basement Construction.

References:

1- Yunus A. Cengel, Michael A. Boles, Thermodynamics: An Engineering Approach, 5th Ed. McGraw-Hill College, Boston, MA, 2006
2- Y. Cengel and John Cimbala, Fluid Mechanics Fundamentals and Applications, 3rd Ed. McGraw-Hill College, Boston, MA, 2013
3- Madan Mehta, Walter Scarborough, Diane Armpriest, Building Construction: Principles, Materials, and Systems, Prentice Hall, 2009.

ELE123 Technical Reports (2,0,0)

Report Types and Patterns, Report Components, Summary Reports, Detailed Reports, Importance and Purposes of Reports, Text Writing, Graphical Representation, Reporting Methods, Presentation Bases, Types, Patterns and Components of Presentation Screens, Reference Research Methods and Documentation Methods, References -Training to write and deliver technical reports.

References:

1. "Technical Report Writing and Style Guide", Tony Atherton, Kindle Edition, 2020.

ELE124 Electronics (1) (2,2,1)

Diode applications such as rectification, logic circuits, peak detectors, voltage multipliers-Applications of special diodes such as photodiode, light emitting diode, and zener diode-BJT Low frequency analysis for the three different amplifier configurations - Different BJT Applications-Power supplies and switching mode power supplies-Regulators.

References:

1. Microelectronic circuits, Adel Sedra and Kenneth Smith, 8th Edition, 2020.
2. Electronic Principles, Albert Malvino and David Bates, 8th Edition, 2015.

ELE125 Management of Engineering Projects (2,1,1)

Introduction to project management, organizational structure of project, project planning, project scheduling, Gantt charts, project management networks, CPM, resource allocation and constraints, cost management, risk management, project performance measurement and control. Measuring project performance and monitoring , finishing and closing projects, using computers in planning and controlling projects using Microsoft Project.

References:

1. "Engineering Projects Management", Neil G. Siegel, Wiley; 1st Edition, 2020.

ELE131 Computer Programming (1) (2,0,3)

Introduction to structured programming, data types, expressions, control structures and loops, arrays, functions, structures, strings, pointers, exception handling, and files.

References:

1. "The C++ Programming Language", by Bjarne Stroustrup, 4th edition, Pearson Inc., 2013.
2. "Professional C++", by Marc Gregoire, 4th Edition, Wrox, 2018.

ELE132 Computer Programming (2) (2,0,3)

Fundamentals of Object-Oriented Programming (OOP), including objects, classes, methods, parameter passing, information hiding, inheritance, method overloading, overriding and polymorphism and their implementations using Java programming language.

References:

1. “Python 3 Object Oriented Programming”, by Dusty Phillips, Packt Publishing, 2018.
2. “Effective Java” , by Joshua Bloch, 3rd Edition, Addison-Wesley Professional, 2018 .

ELE133 Design of Logic Circuits (2,2,1)

Number systems, Boolean algebra, basic logical operations, gates and truth tables. Combinational logic: Minimization techniques, multiplexers and de-multiplexers, encoders, decoders, adders and subtractors. Sequential logic: Flip flops, mono-stable multi-vibrators, latches, registers, counters, and memories.

References:

1. “Digital Logic and Computer Design” By M. Morris Mano, Kindle Edition, Pearson, 2020.
2. “Logic and Computer Design Fundamentals”, by Morris Mano , Charles Kime, and Tom Martin, 5^{th} Edition, Pearson, 2015.

ELE100 Summer Training (1)

The student performs a training during the summer inside the faculty, before the beginning of the first year, for 3 weeks upon different electronics, communications, and computer software packages such as MATLAB, ORCAD PSpice , LabVIEW, and Proteus.

References:

1- Laboratory book (Manual of Experiments)

SECOND YEAR

BAS212 Partial Differential Equations and Numerical Analysis (2,2,0)

Partial Differentiation and Derivatives of vector functions. Gradient/ Divergence/curl/Laplacian. Line integrals, line integrals independent of the path, exactness. Conservative vector fields. Double integrals in Cartesian and polar coordinates, Mathematical expectation, Numerical methods: Finding roots using bisection method, Newton's method, Solution of linear system of equations using Gauess method and matrix decomposition, Solution of partial D.E. (Heat and Wave equations), Lagrange and Newton Interpolation methods.

References:

1- E. Kreyszig, Advanced Engineering Mathematics, John Wiley and Sons, New York 1999

BAS213 Statistics and Probability (2,2,0)

Introduction in statistics and data analysis, Measures of central tendency, Measures of dispersion, Probability theory, Conditional probability, Random variable, Probability density function, Discrete probability distributions, Continuous probability distributions, Curve fitting, Linear regression, Nonlinear regression, Covariance, Correlation Coefficient, Inferences including the mean, Inferences include differences, Quality control.

References:

1- Joe D. Hoffman, Numerical methods for engineers and scientists, 2nd edition, Marcel Dekker, Inc. New York, 2001
2- John Schiller, R. Alu Srinivasanand Murray R. Spiegel, Schaum's Outline of Probability and Statistics, 4th ed.,McGraw Hill 2012.

ELE221 Electronic Measurements (2,2,1)

Measurements of errors, accuracy, judgments, sensitivity, and statistical analysis (mean - deviation - standard deviation - variance). Measurement units and standards, electromechanical measuring instruments, analog instruments (DC ammeter, DC voltmeter, ohmeter, bridge measurements (DC and AC bridges)-Transducers-Analog and digital oscilloscopes-Signal generators-Miscellaneous devices and circuits (Strip chart Recorders, X-Y recorders, plotters, printers)- Introduction to Data acquisition and computerized control measurements.

References:

1- "Electronic Instrumentation and Measurements", David A. Bell, 2013.

ELE222 Electrical and Magnetic Fields (2,2,1)

Vector analysis, Electrostatic fields: Coulomb's law and electric field intensity, electric flux density, Gauss's law and divergence, energy and potential, conductors, dielectrics and capacitance, Poisson and Laplace equations. Steady magnetic fields: Magnetostatic fields: Biot-Savart's w, Ampere's law, curl and Stokes's theorem, magnetic flux density, magnetic forces, Lorentz force, materials and inductance.

References:

1- Introduction to Electromagnetic fields, Clayton R. Paul, McGraw-Hill, 1987.
2- Engineering Electromagnetics, William H. Hayt, McGraw-Hill, 1989.

ELE224 Signal Analysis and Systems (2,2,1)

Representation of signals in the time and frequency domain, classifications of signals and systems, signal processes, linear time invariant systems representations, convolution. Laplace transform and its applications. Fourier series; the continuous and intermittent Fourier transform and their applications, spectral representation, sampling, power and energy spectrum. Applications using Matlab.

References:

1. "Signals and systems", Alan V.Oppenheim, Alan S.Wilsky, 2nd edition, Prentice Hall, 1997.
2. "Signals and systems", Simon Haykin, Barry Van Veen, 2nd edition, Wiley India Pvt. Limited, 2007.

ELE225 Electronics (2) (2,2,1)

Field Effect Transistors (FET) and Metal Oxide Semiconductor Field Effect Transistors (MOSFET), physical operations, DC and AC characteristics, Special Effects, Applications-Fabrication of integrated circuits-TTL and MOS circuits-Optoelectronic Devices-Switching devices (four layer devices: Thyristor, Diac, Triac,..).

References:

1- Microelectronic circuits, Adel Sedra and Kenneth Smith, 8th Edition, 2020.
2- Louis E. Frenzel, Jr. "CONTEMPORARY ELECTRONICS: FUNDAMENTALS, DEVICES, CIRCUITS, AND SYSTEMS", McGraw-Hill 2014.

ELE231 Web Programming (2,0,3)

Introduction to web application, fundamentals of HTML language, fundamentals of CSS language, creating a static webpage, fundamentals of JavaScript language, fundamentals of PHP language, creating dynamics webpages, link the webpages with database via SQL.

References:

1. "Fundamentals of Web Development", by Randy Connolly and Ricardo Hoar, 2nd Edition, Pearson Inc., 2017.
2. "Creating Data-Driven Web Sites: An Introduction to HTML, CSS, PHP, and MySQL", by Bob Terrell, Kindle Edition, Momentum Press, 2019.

ELE232 Computer Organization (2,2,1)

Simple Processor organization, Instruction sets, Addressing modes, Assembly language, CPU organization, Control signals, Hardwired control, Micro-programmed control, ALU Design, Binary adder, Subtractor, Multiplier, Memory Organization, Main Memory, Cache Memory, Virtual Memory, I/O organization, Interrupts, DMA, Bus transfers.

References:

1. "Computer Organization and Design", by David A. Patterson, John L. Hennessy and Morgan Kaufmann, 5th Edition, Pearson, 2017.
2. "The Essentials of Computer Organization and Architecture", by Linda Null, 5th edition, Jones & Bartlett Learning, 2018.

ELE241 Electrical Power Engineering (2,2,0)

Introduction to electric power systems - components of electric power system - power plants - electric transmission lines (overhead transmission lines - ground cables) - electrical distribution systems - types of distribution systems - substations - electrical transformers - circuit breakers - overvoltage in power systems - Overvoltage protection devices - Isolation in different electrical power systems.

References:

1. "Fundamentals of Electrical Power Engineering", Isaak D Mayergoyz, Patrick Mcavoy, World Scientific, 2014.

ELE226 Engineering Economics (2,2,0)

Introduction to economics: economic concepts, types of market, supply and demand law, flexibility, different economic systems, income and cash flow calculation, corporate objectives, balance sheet. Introduction to Engineering Economics: Engineering decision-making, break-even analysis, recovery time method, and production function. Time value of money: simple interest, compound interest, principle of economic parity and separate cash flow, trade-offs between projects, nominal interest rate and real rate. Internal Rate of Return (IRR): calculation of the internal rate of return achieved using the present wealth equation, calculation of the internal rate of return realized using the equivalent annual wealth formula and calculating the internal rate of return for several alternatives using the annual equivalent equation. Depreciation models: the nature of depreciation, calculation of depreciation rates by conventional methods.

References:

1- Leland Blank & Anthony Tarquin, Basics of Engineering Economy, McGraw - Hill, 2008

ELE200 Summer Training (2)

The student performs a training during the summer inside the faculty, before the beginning of the second year, for 3 weeks upon different electronics, communications, and computer software packages such as MATLAB, ORCAD PSpice , LabVIEW, and Proteus.

References:

1- Laboratory book (Manual of Experiments)

THIRD YEAR

ELE322 Computer Networks (2,0,3)

Networking basics (building and configuring networks - types of networks - network components) - OSI reference model and practical model TCP/ IP - Physical layer (cables - data encryption and decoding - determination of data rates) - Data link layer (Error detection and correction) - Network layer (Internet protocol, routing and switching) - Transport layer (TCP and UDP protocols) - Application layer (Telnet-HTTP-DHCP-DNS protocols) - Using simulation tool (packet tracer) to implement static and dynamic switch protocols.

References:

1. Data Communications and Networking, Behrouz A Forouz, McGraw-Hill Education; 5th Edition, 2012.
2. Data Communications and Networking, by M Chandra Sekhar Reddy and Dr P.V.N Reddy, LAP LAMBERT Academic Publishing, 2020.

ELE324 Digital Signal Processing (2,0,2)

Discrete-time sequences and systems, the Z-transform and its inverse, Fourier transforms and frequency response, periodic sampling and reconstruction of band limited signals, digital filter design, filter transformations, the discrete and fast Fourier transform, Fourier analysis, the effect of windowing, correlation, convolution and de-convolution.

References:

1. Digital Signal Processing; A practical guide for Engineers and Scientists, Steven Smith, Newnes,2002.
2. Digital Signal Processing: Fundamentals and Applications, Lizhe Tan, Jean Jiang, Academic Press; 3rd Edition , 2018.
3. Understanding Digital Signal Processing, Richard G. Lyons, Second Edition, PEARSON INDIA; 3rd Edition , 2011.

ELE331 Algorithms and Data Structure (2,0,3)

Design and analysis techniques for solving domain specific problems, algorithm design strategies, distributed algorithms, Lists, Linked Lists, Queues, Trees, Tree searching, Graphs, Hash tables, Stack and heap allocation, Sorting and Searching Algorithms.

References:

1. “Data Structures and Algorithms in Python”, by Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, 1st Edition, Wiley, 2015.
2. “Data Structures and Algorithms in JAVA”, by Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, 6th Edition, Wiley, 2014.

ELE333 Database Design (2,0,3)

The Database development process, Modeling Data, the enhanced ER model and business rules, Logical Database Design, Database Normalization, The Relational Data Model, Physical Database Design, Structured Query Language, Advanced SQL, Object-oriented data modeling.

References:

1. "Modern Database Management ", by Jeffrey A. Hoffer, Mary B. Prescott, Fred R. McFadden, 12th Edition, Pearson, 2017.
2. “Database Systems: Design, Implementation, & Management”, By Carlos Coronel and Steven Morris, 13th edition, Cengage Learning, 2018.

ELE334 Embedded Systems (2,0,2)

Embedded processor architecture and programming, I/O and device driver interfaces to embedded processors with networks, video cards and disk drives. Using operating systems primitives for concurrency, timeouts, scheduling, communication and synchronization, Real-time resource management techniques, and application-level embedded system design concepts such as basic signal processing and feedback control.

References:

1. "Embedded Systems Architecture ",by Daniele Lacamera, Packt Publishing, 2018.
2. “Embedded Systems: A Contemporary Design Tool” By James K. Peckol, 2nd edition, Wiley, 2019.

ELE335 Artificial Intelligence (2,0,3)

General problem solving, Search and control strategies, Exhaustive searches, Heuristic search techniques, Constraint satisfaction problems (CSPs) and models, Knowledge representation, KR using predicate logic, KR using rules, Reasoning System, Symbolic reasoning, statistical reasoning, Learning Systems, Expert Systems, Knowledge base, Inference engine, and applications of AI.

References:

1. "Artificial Intelligence: A Modern Approach ", Stuart j. Russell and Peter Norvig, 4th edition, Prentice Hall, Pearson, 2020.
2. “Artificial intelligence Basics”, by Tom Taulli, 1st edition, Apress, 2019.

ELE336 Computer Architecture (2,0,3)

Basic Understanding for Assessing Performance, Basic pipelined implementation, Memory hierarchies – Caches and Virtual Memory, Instruction level parallelism – hardware and software techniques, Memory hierarchy – advanced concepts in caches main memory, and virtual memory, Data parallel architectures – vectors, SIMD, GPUs, Multiprocessors-multicore, synchronization.

References:

1. "Computer Architecture A Quantitative Approach ", by John L. Hennessy, David A. Patterson, 5th edition, Pearson, 2017.

2. "The Essentials of Computer Organization and Architecture", by Linda Null, 5th edition, Jones & Bartlett Learning, 2018.

ELE337 Systems Analysis and Design (2,0,3)

Approaches to system development, Investigating System Requirements, Modeling Systems Requirements, The Traditional Approach to Requirements (DFD) , Context diagram, Data Dictionary, The Object-oriented approach to requirements (UML), Use Case Diagram, Activity Diagram, Sequence Diagram, State Diagram, Class diagram , Design the application architecture, Design the user interface, Design the Database, Design the system control, Deployment Environment, Three-layer architecture, Internet and web-based application architecture.

References:

1. "Systems Analysis and Design in a Changing World", by John Satzinger, Robert Jackson, Stephen Burd, 9th Edition, Cengage Learning, 2015.

2. "Modern Systems Analysis and Design", By Joseph S. Valacich and Joey F. George, 9th edition, Pearson, 2016.

ELE338 Information Security (2,0,2)

This course introduces an overview of information security. Principles of security including confidentiality, integrity, and availability. Exploration of topics in computer security, threats and defense mechanisms for computer systems by introducing classic cryptographic algorithms, Encryption and privacy: Public key, private key, symmetric key ,protocol analysis, access control, authentication protocols, Packet filtering, Firewalls, Virtual private networks, Intrusion detection systems.

References:

1. "Fundamentals of Information Systems Security", by David Kimis and Michel Solomon, 3rd edition, Jones & Bartlett Learning, 2016.

2. "Introduction to Cryptography and Network Security", by Behrouz A.Forouzan, McGraw-Hill International Edition, 2014.

ELE343 Electrical Machines and Control (2,2,0)

DC machines: installation of DC machine, electric motors, DC generators (working theory, types, equivalent circuit, benefits and efficiency), DC motors (working theory, types, equivalent circuit, efficiency, torque), single-phase electric transformers (working theory, equivalent circuit, vector shape drawing, tests, voltage regulation and efficiency). Automatic control: definition of open-loop and closed-loop systems, control system components, mathematical models of physical systems (mechanical, electrical, electromechanical systems), simplification of the box diagram, signal flow graph, transient response of first and second order control systems, poles / zeros, Stability analysis by Ruth Herwitz.

References:

1. "Modern Control Systems", by by Richard Dorf and Robert Bishop, 13th Edition, Pearson, 2016.
2. "Electrical Machines, Drives and Power Systems", by THEODORE WILDI, Pearson New International Edition, 2005.

ELE300 Field Training (1) (0,0,0)

Students should spend 4 weeks in field training, after completing the Second level, in any Engineering Institution or Engineering Firms. Students should demonstrate the professional and practical skills they acquired during discussion with their assigned tutors.

FOURTH YEAR

ELE431 Operating Systems (2,0,3)

Introduction to Operating Systems, Operating System structure, Process Management, Processes, Threads, CPU Scheduling, Process Synchronization, Deadlocks, Memory Management, Main Memory, Virtual Memory, Storage Management, File system interface, File system implementation, Mass storage structure, Special purpose systems.

References:

1. "Operating Systems Internals and Design Principles" by William Stallings, 9th edition, Pearson, 2017.
2. "Operating System Concepts", by Abraham Silberschatz, Peter B. Galvin, 10th edition, Wiley,2018 .

ELE432 Machine Learning (2,0,3)

This course provides a broad introduction to machine learning and statistical pattern recognition. Topics include supervised learning (generative/discriminative learning, parametric/nonparametric learning, neural networks, and support vector machines); unsupervised learning (clustering, dimensionality reduction, kernel methods); learning theory (bias/variance tradeoffs; VC theory; large margins); and reinforcement learning and adaptive control. The course will also discuss recent applications of machine learning.

References:

1. "Machine Learning Engineering", By Andriy Burkov, True Positive Inc., 2020.
2. "Building Machine Learning powered applications", by Emmanuel Ameisen, 1st edition, O'Reilly Media, 2020.

ELE433 High Performance Computing (2,0,2)

High-performance computer architecture, enhancement of performance on single and multi-processor computers, introduction to parallel algorithms Cache effect, data locality, data dependency., parallelization overheads; performance evaluation; Analysis, design and development of parallel algorithms, High performance programming environments and libraries, Trends in high performance computing.

References:

1. "Introduction to High Performance Scientific Computing", by David L. Chopp, First Edition, SIAM - Society for Industrial and Applied Mathematics, 2019.
2. "Parallel Processing and Parallel Algorithms: Theory and computation", by Seyed H Roosta, Kindle Edition, Springer, 2012.

ELE434 Compilers (2,0,2)

Overview: compilers and interpreters, Lexical Analysis, Syntax Analysis - Parsing, Syntax-directed translation, Intermediate code generation, Run-time environment, Code generation and optimization, Machine independent optimization.

References:

1. "Compilers Principles, Techniques and Tools", by Aho, Lam, Sethi, Ullman, 2nd edition, Pearson, 2013.
2. “Writing Compilers and Interpreters: A Software Engineering Approach”, by Ronald Mak, 3rd edition, Wiley, 2009.

ELE435 Neural Networks (2,0,3)

Single-Layer Perceptron’s, Implementing Learning Algorithms for the Perceptron, Error-Correction Learning, Online and Offline Perceptron Learning Algorithms, Multilayer Perceptron’s, Back Propagation Network, Radial-Basis Function Networks, Support Vector Machines, Kohonen Networks (SOM) , Recurrent Networks.

References:

1. “Neural Networks and Learning Machines”, by Haykin, Simon , Third Edition, Prentice Hall, 2016.
2. “Neural Networks and Deep Learning”, by Charu C. Aggarwal, 1st edition, Springer, 2018.

ELE436 Computer Graphics (2,0,3)

Fundamentals of computer graphics, display devices, fundamentals of graphic algorithms, two-dimensional graphics, polygon representation, polygon filling, polygon clipping, three-dimensional graphics, back face removal, scan line and ray tracing, illumination and shading models.

References:

1. “Fundamentals of Computer Graphics“, by Steve Marschner and Peter Shirley , 4th edition, A K Peters/CRC Press, 2015.
2. “Computer Graphics: Principles and Practice”, by John F. Hughes et al., 3rd edition, Addison-Wesley Professional, 2019.

ELE437 Image Processing (2,0,3)

The basic principles of different methods of digital image processing to optimize image according to specific criteria and extract information such as: image capture - image representation matrix - filtering - initial processing - image splitting - image restoration - feature extraction - feature classification - image understanding - color image processing.

References:

1. "Digital Image Processing", R. C. Gonzalez and R. E. Woods, 4th edition, Pearson Inc., 2018.
2. "Principles of Digital Image Processing", by Wilhelm Burger, Mark J. Burge, Kindle edition, Springer, 2013.

ELE438 Speech Processing (2,0,3)

This course covers; the basics of speech production and perception, a review of DSP fundamentals, acoustic-phonetics, linguistics, speech perception, sound propagation in the human vocal tract, time domain and frequency domain speech representations, cepstrum and homomorphic speech processing, linear predictive analysis, algorithms for estimating speech parameters, digital coding of speech signals, text to speech synthesis, and speech recognition methods.

References:

1. "Theory and Applications of Digital Speech Processing", by Lawrence Rabiner and Ronald Schafe, 1st Edition, Pearson, 2010.
2. "Speech and Language Processing", by Dan Jurafsky, James H. Martin, 2nd edition, Prentice Hall,2008.

ELE439 Distributed Systems (2,0,3)

The Fundamental Concepts of Distributed Systems: Architecture models; communication; complexity of communication; basic algorithms, Time and Global States: Clocks and concepts of time; Event ordering; Synchronization; Global states, Coordination: Distributed mutual exclusion; Multicast; Group communication, Distribution and Operating Systems: Processes and threads, Mobile Computing.

References:

1. "Distributed Systems", by Maarten van Steen and Andrew S. Tanenbaum,CreateSpace Independent Publishing Platform, 2017.
2. "Distributed Systems, Principles & Paradigms", by Andrew S. Tanenbaum, Maarten van Steen, 2nd edition, CreateSpace Independent Publishing Platform, 2016.

ELE461 Data Mining (2,0,3)

Data mining algorithms, tools, and applications; data preprocessing; data mining tasks including classification, clustering, association, and regression; predictive models and descriptive models; model evaluation.

References:

1. "Data Mining: Practical Machine Learning Tools and Techniques", by Ian H. Witten, Eibe Frank, et al., 4th Edition, Morgan Kaufmann, 2016.

2. “Introduction to Data Mining”, by Pang-Ning Tan, et. Al., 2nd edition, Pearson, 2020.

ELE462 Computer Vision (2,0,3)

Fundamentals of image formation, camera imaging geometry, feature detection and matching, motion estimation and tracking, image classification, scene understanding, and deep learning with neural networks. Basic methods for applications that include finding known models in images, depth recovery from stereo, camera calibration, image stabilization, automated alignment, tracking, boundary detection, and recognition.

References:

1. “Computer Vision: Algorithms and Applications”, by Richard Szeliski, Springer, 2010.
2. “Computer Vision: Principles, Algorithms, Applications, Learning”, by E. R. Davies , 5th edition, Academic Press, 2017.

ELE463 Robotics Engineering (2,0,3)

Robot History - Robot Sensors - Actuators- Principle of Robot Vision -Kinematics& Inverse Kinematics- Frames transformation - Behavior programming - Localization - Mapping- Navigation - Manipulator's Kinematic- Case study.

References:

1. “Robotics: Everything You Need to Know About Robotics from Beginner to Expert”, by Peter Mckinnon, CreateSpace Independent Publishing Platform, 2016.
2. “Introduction to Robotics” by John J. Craig, 4th edition, Pearson, 2017.

ELE464 Big Data Analysis (2,0,3)

New techniques and methodologies for processing and analyzing big data, The Hadoop architecture, Managing Data Input and Output, Common MapReduce Algorithms, Hadoop Tools for Data Acquisition, Complex Data Analysis with Pig, Relational Data Analysis with Hive, Introduction to Spark.

References:

1. “Big Data Analysis with Python”, By Ivan Marin, Ankit Shukla, and Sarang VK, 1st Edition , Packt Publishing, 2019.
2. “The Enterprise Big Data Lake”, by Alex Gorelik, Kindle Edition, O'Reilly Media, 2019.

ELE465 Internet of Things (2,0,3)

Foundational knowledge in sensors and actuators, fusion of data from multiple sensors, sensor data calibration and topics in sensor data analytics: pre-processing and extraction of features in time-series sensor data, and classification methods using a selection of machine learning techniques. The students conduct a major piece of coursework working in pairs to develop an application using an IoT platform together with a mobile application. Students will experience all the stages in the design and implementation of a complex system - from its specification to the demonstration of a working prototype.

References:

1. "The Internet of Things", by Samuel Greengard, The MIT Press, 2015.
2. "Internet of Things (A Hands-on-Approach)", by Arshdeep Bahga, Vijay Madisetti, 1st edition, VPT, 2014.

ELE466 Software Engineering (2,0,3)

Software processes, Software requirements and specifications, Software Modeling, Software design, Object-Oriented Design, Rapid Software Development, Software Quality Assurance, Software Validation and Verification (V&V), Quality Standards, Quality Control Testing (QC), Software Testing, Design Test cases.

References:

1. "Software engineering", by Summerville , 10th edition, Pearson. 2018.
2. "Essentials of Software Engineering", by Frank Tsui, Orlando Karam, Barbara Bernal, 4th edition, Jones & Bartlett Learning, 2016.

ELE467 Selected Topics in Computer Engineering (2,0,3)

Selected topics related to the state of the art in computer engineering.

ELE491 Graduation Project (1) (0,0,3)

The topics proposed for the graduation projects are collected from the faculty members, the students are divided into groups, each group selects one of the proposed projects, and each group implements the following activities: Review previous studies; Plan project implementation, analyze project requirements, collect data needed to implement the project, design the proposed solutions. Preparing the initial project documentation, initial presentation of the theoretical part of the project.

ELE492 Graduation Project (2) (0,0,5)

A continuation of ELE491, students implement the practical part of the project through the following activities: implementing the designed components in the first phase of the project using appropriate tools according to the nature of the project, component testing, integration of implemented components, system testing, analysis and evaluation of results, project documentation, project presentation.

ELE400 Field Training (2) (0,0,0)

Students should spend 4 weeks in field training, after completing the third level, in any Engineering Institution or Engineering Firms. Students should demonstrate the professional and practical skills they acquired during discussion with their assigned tutors.

UNIVERSITY REQUIREMENTS

GEN0X0 Technical Language (2,0,0)

Characteristics of the English or French or German technical language, grammar review, effective sentences and their characteristics, identify some common mistakes in the writing of technical sentence, paragraph construction, types of paragraphs, development of communication skills by reading and analysis of excerpts from technical writing in various engineering disciplines such as mechanical, electrical , civil ... etc.

References:

1- Mark Hancock & Annie McDonald, English Result - Intermediate Level, Oxford University press, Last Edition.
2- Durrell, Martin, “Using German: a guide to contemporary usage / Martin Durrell”, Cambridge, U.K. ; New York : Cambridge University Press, 2003.
3- Coffman Crocker, Mary E, “, Schaum's outline of French grammar”, McGraw-Hil, Schaum's outline series, 1999, 4th ed.

GEN011 Computer Skills (1,0,1)

IT concepts and terminology, Computer hardware, operating systems, Computer networks, Internet, Computer graphics, Multimedia systems, Databases. Practical applications: Operating system (Microsoft Windows), Word processing (Microsoft Word), Spreadsheets (Microsoft Excel), Microsoft PowerPoint, Databases (Microsoft Access). Introduction to programming concepts, programming languages and their classification, logical design of programs and algorithms, structural programming and object-oriented programming.

References:

1- Practice using ICDL components

GEN012 History of Engineering & Technology (2,0,0)

The definition of science, technology, engineering and architecture. The development of civilizations and their relationship to human sciences (ancient Egyptian civilization, Roman and Greek civilization, Mesopotamia, dark ages, industrial revolution). Different engineering disciplines and their role in society. The historical relationship between science and technology. The relationship between the development of engineering, the social and economic development of the environment, the challenges of globalization and the new economy. The contribution of engineers in the new millennium, the issues of economic and industrial development in Egypt.

References:

1- James E. McClellan & Harold Dorn, Science and Technology in World History: An Introduction, The Johns Hopkins University Press, 2nd. Ed., 2006.

2- Richard Shelton Kirby, Engineering in History, Dover publications, 1990.

GEN900 Communication & Presentation Skills (1,1,0)

General introduction to communication, the importance of communication, types of communication, communication barriers, listening skills, attributes and methods of reading, verbal communication: speaking and writing skills, non-verbal communication, dialogue skills and strategies of persuasion, communication in the work environment, writing CVs, reports and official letters.

References:

1- Gary Johns and Alan M. Saks, Organizational Behavior, Addison Wesley Longman, 2009.
2- Scgermerhorn, Jr., R. J., Hunt, G. J., and Osborn, N. R., Organizational Behavior, John Wiley & Sons, Inc., New York, 10th. Ed., 2008.

GEN901 Theory of Sustainability (1,1,0)

The course aims to introduce students to the concept of sustainability and its feasibility in order to develop its capabilities to reach architectural applications that contribute to achieving the goals of sustainability and its usefulness and to clarify the risks of unsustainable environment. The course deals with the components of the natural environment and the factors of preserving its components and equilibrium, the biological system, cycles and ecological chains, the presence characteristics of natural resources, energy and biological systems. Rapid development of sustainability applications and their comprehensiveness based on modern means of communication and digital technologies.

References:

1- Perspectives for a New Social Theory of Sustainability, Mariella Nocenzi and Alessandra Sannella, Springer Nature Switzerland 2020 .

GEN902 Human Rights and Combating Corruption (1,1,0)

Human rights: general introduction, definition of human rights, characteristics and principles of human rights, general rules of the idea of human rights, historical development of the idea of human rights, types of human rights, individual rights, collective rights (people's rights), sources of human rights, legal system of rules of protection Human rights, human rights according to the Egyptian constitution in 2014, the duties and obligations of individuals in society. Combating corruption: definition of corruption, its causes, effects and characteristics, types of corruption and its causes, the impact of corruption on human rights and development, the impact of corruption on economic rights and sustainable development, criminal confrontation of corruption.

References:

1- Peter Joseph , The New Human Rights Movement: Reinventing the Economy to End Oppression, Inc. Blackstone Audio: Books, 2017

GEN903 Research and Analysis Skills (1,1,0)

Scientific thinking and its characteristics, definition of scientific research and its characteristics, steps of scientific research (selection of the subject of research, determine the problem of research and selection factors, determine the framework of research, determine the method of research, data analysis), types of scientific studies: exploratory studies, descriptive studies, experimental studies . Methods of scientific research: descriptive approach, social survey, content study, content analysis. Data collection tools: Metrics, observation, interview, questionnaire. Data presentation and analysis methods: Descriptive methods, deductive methods.

References:

1- Gary Johns and Alan M. Saks, Organizational Behavior, Addison Wesley Longman, 2009.
2- Scgermerhorn, Jr., R. J., Hunt, G. J., and Osborn, N. R., Organizational Behavior, John Wiley & Sons, Inc., New York, 10th. Ed., 2008.

GEN904 Entrepreneurship (1,1,0)

Concepts in Entrepreneurship, Entrepreneurship and Small Enterprises, Generating Ideas for Entrepreneurial Projects, University and Entrepreneurship Opportunities and Challenges, Marketing Plan, Operational Plan, Financial Plan, Business Plan Writing, Technological Environment of Entrepreneurship, External Business Environment of Entrepreneurial Projects, Support Programs for Leading Projects Egyptian Economy, Entrepreneurial Project Presentation Skills.

References:

1- Entrepreneurship: An Evidence-Based Guide by Robert A Baron Edward Elgar Pub., 2012.

GEN905 Professional Ethics (1,1,0)

The course provides the background needed to discuss the core topics of engineering ethics, with a focus on the ethical issues facing engineers in the areas of engineering work in companies. The course includes the definition of the general elements of the ethics of the profession and the observance of the public interest and regulations and regulations, obligations to the community, the responsibilities of engineers, disclosure of violations, behavior, basic principles and codes of the ABET code of conduct of engineers.

References:

1- William Frey, Professinnal Ethics in Engineering, November, 2013, http://cnx.org/content/col10399/1.4/

GEN906 Critical Thinking (1,1,0)

Theoretical concepts (memory, thinking, creativity), an introduction to the thinking skills, the nature of thinking (definition, characteristics, levels), types of thinking (creative, critical, scientific), cognitive thinking skills, meta-cognitive thinking skills, thinking measurement tools, strategies Used in the development of thinking skills, programs to teach thinking skills, methods of teaching thinking skills.

References:

1- Critical Thinking: A Beginner's Guide to Critical Thinking, Better Decision Making and Problem Solving Paperback, by Jennifer Wilson,, Create Space Independent Publishing Platform 2017.

GEN907 Human Resources Management (1,1,0)

Historical development of human resources management, key functions of human resources management, human resources planning, access to human resources, training and development of human resources, compensation of human resources, human resource conservation.

References:

1- Human Resource Management, University of Minnesota Libraries Publishing, 2016

GEN908 Contracts and Legislation (1,1,0)

The course aims to provide the student with the technical and legislative knowledge related to the practice of the profession. The study of building legislation, urban planning and the laws governing the practice of the profession and the work systems (engineer / owner / contractor / ...) at the local and international levels as well as studying the methods of contracting/rules and systems for the preparation of integrated implementation documents. Tenders and methods of their examination and evaluation.

References:

1- Randall S. Schuler, Susan E. Jackson, Strategic Human Resoure Management , Wiley, 2nd ed., 2007.
2- Lewicki, J. R., Saunders, M. D., and Barry, B., Essentials of Negotiation, McGraw - Hill, 5th. Ed., 2011.

GEN909 Method of Scientific Research and Writing (1,1,0)

The course aims to develop the student's abilities to conduct applied scientific research in one of the fields presented for the graduation project and train to work within a research team, while following the steps of sound scientific research to draw conclusions. The elements and components of scientific research: research problem, scientific method to solve problems and fundamental differences between different scientific research methods, methods of collecting data and statistics necessary for research, methods of examination and analysis of data and information and scientific dealing with variables, formulation of research hypotheses, methods of discussion and examination of hypotheses, drawing conclusions. Scientific method of writing a scientific research (thesis writing). The students select one of the problems in the architectural, urban or any technical field, previously presented as the basis for the graduation project, to conduct the necessary scientific research. Finally, the student is discussed orally through a committee to evaluate the student's performance, within his group, and his findings, studies, analyzes, conclusions and recommendations for the graduation project thesis.

References:

1- Research Methodology and Scientific Writing, by C. George Thomas, Ane Books Pvt. Ltd., 2016

STUDY PLANS FOR CIVIL ENGINEERING PROGRAMS

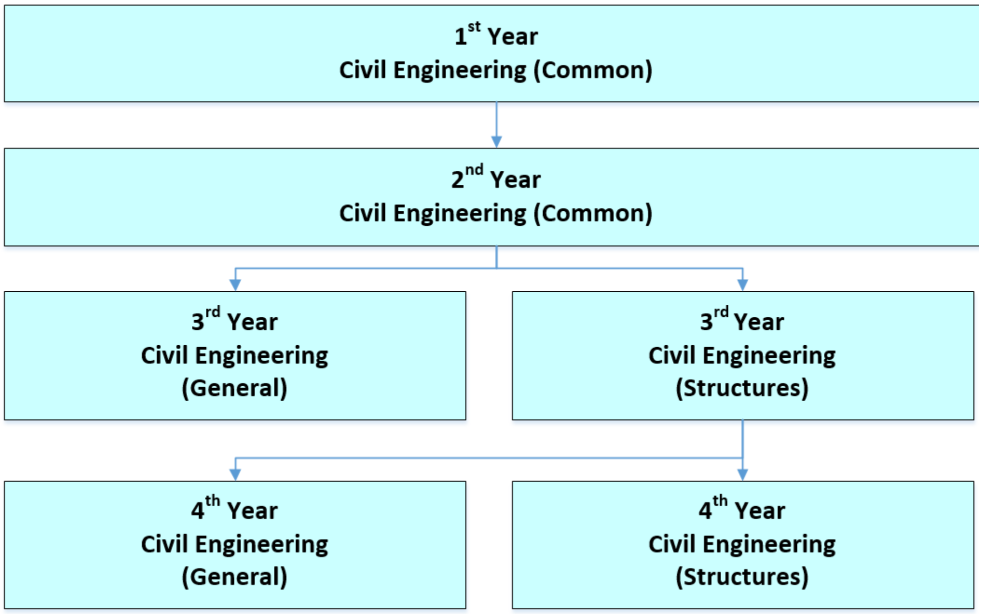
CIVIL ENGINEERING

CIVIL ENGINEERING DEPERTMENT
UNDERGRADUATE PROGRAMS

The Department of Civil Engineering has two academic programs as follows:

1- Civil Engineering Program (General).
2- Civil Engineering Program (Structures).

The following is the department's plan:



CIVIL ENGINEERING - GENERAL PROGRAM

Program Information

1. **Faculty vision:**

   The faculty of Engineering at Shoubra, Benha University, aspires to be a pioneering college at the national, regional and international levels in the fields of engineering education, scientific research, innovation and entrepreneurship in order to achieve the goals of sustainable development.

2. **Faculty Mission**

   The faculty of Engineering at Shoubra is committed to prepare a graduate with competencies and problem-solving skills that qualify each engineer to compete in local and regional labor markets, the graduate will be able to innovate and become an entrepreneur. The faculty is also committed to the development of engineering sciences and producing internationally distinguished scientific research, within the framework of human values and social responsibility.

3. **Program Vision**

   The General Civil Engineering Program in Shoubra Faculty of Engineering aims to be distinguished both locally and regionally, and to compete with international educational institutions in engineering and technological sciences, scientific research, community development and communication. The program also aims to cooperate with local and international scientific and educational institutions. It supports innovation and entrepreneurship in the fields of general civil engineering to achieve sustainable development goals.

4. **Program Mission**

   The General Civil Engineering Program at the Department of Civil Engineering prepares cadres of specialists by providing them with specialized knowledge, skills, and scientific, technological and professional values under national standards. The program aims to achieve the needs of the Egyptian community and the region by providing high-quality programs in education and scientific research and community service to qualify graduates academically, professionally and ethically. The program is also committed to preparing graduates who can compete in the labor market locally and regionally within a framework of human and ethical values.

To judge the compatibility between the program mission and faculty mission, the following matrix is used.

Key Words of Faculty Mission / Key Words of Program Mission	Preparing a graduate with competencies and problem-solving skills.	Preparing a graduate with the ability for innovation and entrepreneurship.	Produce internationally distinguished scientific research	Adherence to human values and social responsibility frameworks.
Provide advanced general civilian programs.	√	√		
High quality in education, scientific research and community service	√		√	√
Prepare a cadre of specialists		√		
A graduate who is able to compete in the job market locally, regionally and nationally			√	
As part of the human and moral values				√

5. Program aims

The Civil Engineering -General program aims to:

1. Providing a distinguished academic curriculum under international standards in the field of general civil engineering; to ensure keeping pace with continuous development and identifying up-to-date scientific issues in the field of specialization; taking into account professional and ethical aspects and social responsibility.
2. Providing an educational environment that enables students to achieve their goals in a program that supports their ability to understand and innovate by conducting experiments, analysis, simulations, and evaluations to describe conclusions.
3. Providing students with the foundations of engineering sciences and mathematics to solidify an understanding of the fundamentals of general civil engineering and move forward to handle advanced studies in these fields taking advantage of up-to-date technologies and modern applications.
4. Working efficiently with various disciplines and demonstrating professionalism, competence and responsibility.
5. Empowering graduates to work not only in the local markets by practicing research techniques, self-learning, and post-graduate studies, but also at the regional level, especially in the Arab world and Africa, to achieve economic growth.
6. Gaining students, the ability to solve problems and develop solution plans according to high technical specifications and enforcement of codes of practice, quality standards, health requirements, and environmental issues.
7. Maintaining professional ethics and general morals in all activities and the ability to adapt and deal with different projects.

To judge the compatibility of program mission with its objectives, the following matrix is used:

Key sentences of the faculty mission / Key sentences of the program mission	Preparing a graduate with competencies and problem-solving skills.	Preparing a graduate with the ability for innovation and entrepreneurship.	Produce internationally distinguished scientific research	Adherence to human values and social responsibility frameworks.
Provide advanced general civilian programs.	√	√		
High quality in education, scientific research and community service	√		√	√
Prepare a cadre of specialists		√		
A graduate who is able to compete in the job market locally, regionally and nationally			√	
As part of the human and moral values				√

6. Graduate Attributes

1. Identify, formulate, and solve complex civil and infrastructural engineering problems by applying engineering fundamentals, basic science and mathematics.
2. Develop and conduct appropriate experimentation and/or simulation, analyze and interpret data of infrastructural problems, assess and evaluate findings, and use statistical analysis and objective engineering judgment to draw conclusions.
3. Apply civil engineering design processes to evaluate cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental,

ethical and other aspects and within the principles and contexts of sustainable design and development.

4. Utilize contemporary technologies, infrastructural engineering codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.

5. Practice research techniques and methods of investigation as an inherent part of learning.

6. Plan, supervise and monitor implementation of infrastructural engineering projects, taking surveying, mechanical, and geotechnical requirements into consideration.

7. Function efficiently as an individual and as a member of multi-disciplinary and multicultural teams in international civil engineering firms.

8. Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.

9. Use creative, innovative and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.

10. Acquire and apply new knowledge in civil engineering; and practice self, lifelong and other learning strategies.

11. Recognize the extent on own knowledge and experience in civil engineering (General) and seek advice from other professionals when needed.

12. Isolate the root cause of problems during design, implementation, and maintenance of civil projects and then find ways to overcome them.

7. Program Competencies

According to the National Academic Reference Standard, the program in Civil Engineering - General must satisfy the following Competencies:

1- General Engineering NARS Competencies in 2018		
Level A (NARS)	A.1	Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.
	A.2	Develop and conduct appropriate experimentation and/or simulation, analyze and interpret data, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.
	A.3	Apply engineering design processes to evaluate cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the discipline and within the principles and contexts of sustainable design and development.
	A.4	Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.
	A.5	Practice research techniques and methods of investigation as an inherent part of learning.
	A.6	Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.
	A.7	Function efficiently as an individual and as a member of multi-disciplinary and multi-cultural teams.
	A.8	Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.
	A.9	Use creative, innovative and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.
	A.10	Acquire and apply new knowledge; and practice self, lifelong and other learning strategies.
2- Civil NARS Competencies in 2018		
Level B (NARS)	B.1	Select appropriate and sustainable technologies for construction of buildings, infrastructures and water structures; using either numerical techniques or physical measurements and/or testing by applying a full range of civil engineering concepts and techniques of: Structural Analysis and Mechanics, Properties and Strength of Materials, Surveying, Soil Mechanics, Hydrology and Fluid Mechanics.
	B.2	Achieve an optimum design of Reinforced Concrete and Steel Structures, Foundations and Earth Retaining Structures; and at least three of the following civil engineering topics: Transportation and Traffic, Roadways and Airports, Railways, Sanitary Works, Irrigation, Water Resources and Harbors; or any other emerging field relevant to the discipline.

	B.3	Plan and manage construction processes; address construction defects, instability and quality issues; maintain safety measures in construction and materials; and assess environmental impacts of projects.
	B.4	Deal with biddings, contracts and financial issues including project insurance and guarantees.
3- Civil Engineering -General ARS		
Level C (ARS)	C.1	Select an adequate design for water purification works and water networks. In addition, design different wastewater treatment plants units and sewerage systems. Produce detailed drawings of the different units for water and wastewater systems.
	C.2	Propose an optimum geometrical alignment and provide an ideal structural design for a given road. Design the different items for an airport and produce drawings of the different items for construction.
	C.3	Study the current / future traffic and transportation problems for a given transportation facility. Propose the optimum solution to tackle these problems. Investigate the impact of new construction on the current and future transportation systems.
	C.4	Apply knowledge of contemporary railway engineering. Exchange knowledge and skills with engineering community and industry. Plan passenger and freight stations. Produce horizontal and vertical plans of railway crossings. Prepare calculation reports and construction drawings based on national and international standards.
	C.5	Plan the alignment of a system of canals and drains for the area to be irrigated. Design cross and longitudinal sections for canals and drains. Design the alignment of modern irrigation networks and irrigation structures. Prepare calculation reports and construction drawings based on national and international standards.
	C.6	Carry out soil sampling and testing. Prepare complete factual and interpretative reports for the subsurface investigation study. Analyze and design soil retaining systems, foundations, soil slopes, and dewatering systems. Prepare calculation reports and construction drawings based on national and international standards.
	C.7	Provide the principles and theories of construction engineering and management sciences to solve construction industry problems and supervision of construction projects using modern technology.

To judge the compatibility of program objectives with its competencies, the following matrix is used:

Program Objectives	Program Competencies																				
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6	C7
Objective #1	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Objective #2	√							√			√	√	√	√							
Objective #3	√	√					√	√	√												
Objective #4							√	√	√												
Objective #5	√	√	√	√			√	√	√												
Objective #6			√		√					√											

PROGRAM REQUIREMENTS

CIVIL Engineering Program Requirements (GENERAL)

#	Requirements	Contact Hours	%	% according to reference framework
1	Humanities & Social Science	20	8	8-12
2	Business Administration	6	3.60	2-4
3	Mathematics & Basic Sciences	63	25.2	20-26
4	Engineering Knowledge	13	5.60	3-6
5	Basic Engineering Science	65	26	25-30
6	Applied Engineering and Design	73	29.2	25-30
7	Projects & Training	10	4.80	3-6
		250	100	

#	Subjects	Contact Hours	%	Min. Percentage according to reference framework (%)
1	University Requirements	20	8	8
2	Faculty Requirements	70	28	20
3	Major Specialization Subjects	97	39	35
4	Minor Specialization Subjects	63	25	Maximum 30
		250	100	

D. LIST OF COURSES
CIVIL ENGINEERING PROGRAM (GENERAL)

No.	Code	Course	Contact Hrs				
			Lec.	Tut.	Lab.	Total	
University Requirements (20 Contact Hours)							
1	GEN0x0	Elective from language list	2	0	0	2	2
2	GEN011	Computer Skills	1	0	1	2	1
3	GEN012	History of Engineering & Technology	2	0	0	2	2
4	GENxxx	Elective (1) – University list	1	1	0	2	1
5	GENxxx	Elective (2) – University list	1	1	0	2	1
6	GENxxx	Elective (3) – University list	1	1	0	2	1
7	GENxxx	Elective (4) – University list	1	1	0	2	1
8	GENxxx	Elective (5) – University list	1	1	0	2	1
9	GENxxx	Elective (6) – University list	1	1	0	2	1
10	GENxxx	Elective (7) – University list	1	1	0	2	1
Faculty Requirements (70 Contact Hours)							
1	BAS010	Differential Calculus and Algebra	2	2	0	4	3
2	BAS011	Statics	2	1	2	5	3
3	BAS012	Engineering Chemistry	2	1	2	5	3
4	BAS013	Physics of Materials & Electricity	2	1	3	6	3
5	BAS014	Integral Calculus & Analytical Geometry	2	2	0	4	3
6	BAS015	Dynamics	2	1	2	5	3
7	BAS016	Physics of Light, Heat and Magnetism	2	1	2	5	3
8	BAS218	Differential Equations	2	3	0	5	3
10	MEC010	Engineering Drawing (1)	0	3	0	3	1
11	MEC011	Principles of Manufacturing Engineering	1	0	2	3	2
12	MEC012	Engineering Drawing (2)	0	3	1	4	2
13	ARC130	Architectural Construction	1	0	2	3	2
14	CIV112	Geology Science	2	2	0	4	3
16	CIV113	Economics and Statistics	2	2	0	4	3
17	CIV100	Summer Training	0	0	0	0	0
18	CIV200	Field Training (1)	0	0	0	0	0
19	CIV300	Field Training (2)	0	0	0	0	0
20	CIV490	Graduation Project	0	0	10	10	3
Major Specialization Subjects (97 Contact Hours)							
1	GED130	Surveying (1)	2	0	2	4	3
3	CIV110	Structural Analysis (1)	2	2	0	4	3
4	CIV111	Materials Science	2	2	1	5	3
5	CIV114	Civil Engineering Drawing	1	2	1	4	2
6	CIV115	Structural Analysis (2)	2	2	0	4	3
7	CIV116	Properties of materials	2	0	3	5	3
8	CIV117	Engineering Math Using Computers	1	0	3	4	2
9	CIV210	Structural Analysis (3)	3	3	0	6	4
10	CIV211	Properties of Structural Materials (1)	2	1	2	5	3
11	CIV212	Reinforced Concrete (1)	3	3	0	6	4

12	CIV213	Fluid Mechanics	2	2	0	4	3
13	CIV215	Structural Analysis (4)	2	2	1	5	3
14	CIV216	Properties of Structural Materials (2)	3	0	2	5	3
15	CIV217	Reinforced Concrete (2)	3	3	0	6	4
17	CIV2xx	Computer Elective (1) -List (1)	1	0	1	2	1
18	CIV2xx	Computer Elective (2)-List (2)	1	0	1	2	1
19	CIV311	Geotechnical Engineering	2	0	2	4	3
20	CIV314	Hydraulics	2	2	0	4	3
21	CIV313	Steel Structures (1)	2	3	0	5	3
22	BAS114	Numerical analysis and Operations Research	3	3	0	6	4
23	CIV330	Projects Management	3	3	0	6	4
Minor Specialization Subjects (63 Contact Hours)							
1	CIV310	Structural Analysis Using Computers	2	0	2	4	3
2	CIV411	Highways & Airports Engineering (2)	2	2	0	4	3
3	CIV315	Transportation & Traffic Engineering (1)	3	3	0	6	4
4	CIV316	Highways & Airports Engineering (1)	2	1	1	4	3
5	CIV317	Geotechnical Engineering and Foundations (1)	2	1	2	5	3
6	CIV318	Reinforced Concrete (3)	2	2	0	4	3
7	CIV319	Irrigation Engineering	2	2	0	4	3
8	CIV410	Geotechnical Engineering and Foundations (2)	2	3	0	5	3
9	CIV412	**Design of Irrigation Works**	2	3	0	5	3
10	CIV413	Sanitary Engineering (1)	2	3	0	5	3
11	CIV414	Railway Engineering (1)	2	2	0	4	3
12	CIV415	Design of Concrete Structures	2	2	0	4	3
13	CIV416	Steel Structures (2)	2	2	0	4	3
14	CIV4xx	Elective (1)- Civil Engineering (General) - List 1	1	2	0	3	2
15	CIV4xx	Elective (2)- Civil Engineering (General) - List 2	2	0	0	2	2

COURSES CLASSIFICATION

CIVIL ENGINEERING PROGRAM (GENERAL)

No.	Code	Course	Contact Hrs			
			Lec.	Tut.	Lab.	Total
Humanities & Social Science Subjects (20 Contact Hours)						
1	GEN010	Elective from language list	2	0	0	2
2	GEN011	Computer Skills	1	0	1	2
3	GEN012	History of Engineering & Technology	2	0	0	2
4	GENxxx	Elective (1) – University list	1	1	0	2
5	GENxxx	Elective (2) – University list	1	1	0	2
6	GENxxx	Elective (3) – University list	1	1	0	2
7	GENxxx	Elective (4) – University list	1	1	0	2
8	GENxxx	Elective (5) – University list	1	1	0	2
9	GENxxx	Elective (6) – University list	1	1	0	2
10	GENxxx	Elective (7) – University list	1	1	0	2
Business Administration (6 Contact Hours)						
1	CIV330	Projects Management	3	3	0	6
Mathematics & Basic Sciences (63 Contact Hours)						
1	BAS010	Differential Calculus and Algebra	2	2	0	4
2	BAS011	Statics	2	1	2	5
3	BAS012	Engineering Chemistry	2	1	2	5
4	BAS013	Physics of Materials & Electricity	2	1	3	6
5	BAS014	Integral Calculus & Analytical Geometry	2	2	0	4
6	BAS015	Dynamics	2	1	2	5
7	BAS016	Physics of Light, Heat and Magnetism	2	1	2	5
8	CIV111	Materials Science	2	2	1	5
9	CIV112	Geology Science	2	2	0	4
10	BAS114	Numerical analysis and Operations Research	3	3	0	6
11	BAS218	Differential Equations	2	3	0	5
12	CIV1 13	Economics and Statistics	2	2	0	4
13	CIV117	Engineering Math Using Computers	1	0	4	5
Business Administration (6 Contact Hours)						
1	CIV330	Project Management	3	3	0	6
Engineering Knowledge Subjects (13 Contact Hours)						
1	MEC011	Principles of Manufacturing Engineering	1	0	2	3
2	ARC130	Architectural Construction	1	0	2	3
1	MEC010	Engineering Drawing (1)	0	3	0	3
2	MEC012	Engineering Drawing (2)	0	3	1	4
Basic Engineering Science Subjects (65 Contact Hours)						
1	GED130	Surveying (1)	2	0	2	4
2	CIV110	Structural Analysis (1)	2	2	0	4
3	CIV114	Civil Engineering Drawing	1	2	1	4
4	CIV115	Structure Analysis (2)	2	2	0	4

5	CIV116	Properties of material	2	0	3	5
6	CIV210	Structural Analysis (3)	3	3	0	6
7	CIV211	Properties of Structural Materials (1)	2	1	2	5
1	CIV212	Reinforced Concrete (1)	3	3	0	6
11	CIV213	Fluid Mechanics	2	2	0	4
13	CIV215	Structural Analysis (4)	2	2	1	5
14	CIV313	Steel Structures (1)	2	3	0	5
15	CIV311	Geotechnical Engineering	2	0	2	4
16	CIV317	Geotechnical Engineering and Foundations (1)	2	1	2	5
17	CIV410	Geotechnical Engineering and Foundations (2)	2	3	0	5
Applied Engineering and Design Subjects (73 Contact Hours)						
1	CIV216	Properties of Structural Materials (2)	2	0	3	5
2	CIV217	Reinforced Concrete (2)	3	3	0	6
3	CIV2xx	Computer Elective (1)- List 1	1	0	1	2
4	CIV2xx	Computer Elective (2)-List 2	1	0	1	2
5	CIV411	Highways and Airports Engineering (2)	2	2	0	4
6	CIV312	Reinforced Concrete (3)	2	2	0	4
7	CIV310	Structural Analysis Using Computers	2	0	2	4
1	CIV314	Hydraulics	2	2	0	4
11	CIV315	Transportation & Traffic Engineering (1)	3	3	0	6
13	CIV316	Highways & Airports Engineering (1)	2	1	1	4
14	CIV318	Reinforced Concrete (3)	2	2	0	4
15	CIV319	Irrigation engineering	2	2	0	4
16	CIV412	**Design of Irrigation Works**	2	3	0	5
17	CIV413	Sanitary Engineering (1)	2	3	0	5
18	CIV414	Railway Engineering (1)	2	1	1	4
19	CIV415	Design of Concrete Structures	2	2	0	4
20	CIV416	Steel Structures (2)	2	2	0	4
21	CIV4xx	Elective (1) -Civil Engineering (General) - List 1	1	2	0	3
22	CIV4xx	Elective (2) - Civil Engineering (General) - List 2	2	0	0	2
Projects and Field Training Subjects (10 Contact Hours)						
1	CIV100	Summer Training	0	0	0	0
2	CIV200	Field Training (1)	0	0	0	0
3	CIV300	Field Training (2)	0	0	0	0
4	CIV490	Graduation Project	0	0	10	10

STUDY PLAN

STUDY PLAN

PREPARATORY YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
BAS010	Differential Calculus and Algebra	2	2	0	4	60	0	60	120	3
BAS011	Statics	2	1	2	5	45	30	75	150	3
BAS012	Engineering Chemistry	2	1	2	5	45	30	75	150	3
BAS013	Physics of Materials & Electricity	2	1	3	6	45	45	90	180	3
MEC010	Engineering Drawing (1) ×	0	3	0	3	25	20	45	90	3
GEN010	Technical Language	2	0	0	2	30	0	30	60	2
		10	**8**	**7**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
BAS014	Integral Calculus & Analytical Geometry	2	2	0	4	60	0	60	120	3
BAS015	Dynamics	2	1	2	5	45	30	75	150	3
BAS016	Physics of Light, Heat and Magnetism	2	1	2	5	45	30	75	150	3
MEC011	Principles of Manufacturing Engineering†	1	0	2	3	25	20	45	90	3
MEC012	Engineering Drawing (2) ×	0	3	1	4	30	30	60	120	3
GEN011	Computer Skills ×	1	0	1	2	15	15	30	60	2
GEN012	History of Engineering & Technology	2	0	0	2	30	0	30	60	2
		10	**7**	**8**	**25**				**750**	

× In exercises, students are divided into groups of 15 students each. Two faculty staff members or their assistants will teach each group.

† In workshops, students are divided into groups of 15 students each, and a faculty staff member (or an assistant) as well as a practical trainer will teach the group.

STUDY PLAN

FIRST YEAR (COMMON)
CIVIL ENGINEERING PROGRAM (GENERAL)

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
CIV100	Summer Training*	0	0	0	0	-	-	-	-	-
GED130	Surveying (1)	2	0	2	4	30	30	60	120	3
CIV110	Structural Analysis (1)	2	2	0	4	60	0	60	120	3
CIV111	Materials Science	2	2	1	5	45	30	75	150	3
CIV112	Geology Science	2	2	0	4	60	0	60	120	3
CIV113	Economics and Statistics	2	2	0	4	60	0	60	120	3
CIV114	Civil Engineering Drawing*ˣ	1	2	1	4	30	30	60	120	4
		11	**10**	**4**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
GENXXX	Elective (1) – University list	1	1	0	2	15	15	30	60	2
BAS114	Numerical analysis and Operations Research	3	3	0	6	90	0	90	180	3
ARC130	Architectural Construction	1	2	0	3	45	0	45	90	3
CIV115	Structural Analysis (2)	2	2	0	4	60	0	60	120	3
CIV116	Properties of Materials	2	0	3	5	45	30	75	150	3
CIV117	Engineering Math Using Computers	1	0	4	5	45	30	75	150	3
		10	**8**	**7**	**25**				**750**	

* Prior to registering in first year, the student should have completed 3 weeks of training in Civil Drawing using Computer (CIV100) for 3 weeks during summer for 5 days per week. The daily training is for 5 hours (2 hrs Lecture + 3 hrs tutorial), amounting to a total of 25 hours per week. A maximum grade of 20 marks is added to the 'semester work' grades of the course Civil Engineering Drawing (CIV114) of the first year.

× The students are divided into groups; two staff members or teaching assistants teach each group of 15 students.

STUDY PLAN (Cont.)

SECOND YEAR (COMMON)
CIVIL ENGINEERING PROGRAM (GENERAL)

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
GENXXX	Elective (2) from University list	1	1	0	2	30	0	30	60	2
CIV210	Structural Analysis (3)	3	3	0	6	45	45	90	180	3
CIV211	Properties of Structural Materials (1)	2	1	2	5	45	30	75	150	3
CIV212	Reinforced Concrete (1)	3	3	0	6	90	0	90	180	4
CIV213	Fluid Mechanics	2	2	0	4	30	30	60	120	3
CIV2xx	Computer Elective (1)- List 1	1	0	1	2	15	15	30	60	3
		13	**9**	**3**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
GENXXX	Elective (3) from University list	1	1	0	2	15	15	30	60	2
CIV215	Structural Analysis (4)	2	2	1	5	45	30	75	150	3
CIV216	Properties of Structural Materials (2)	2	0	3	5	45	30	75	150	3
CIV217	Reinforced Concrete (2)	3	3	0	6	90	0	90	180	4
CIV218	Differential equations	2	3	0	5	45	30	75	150	3
CIV2xx	Computer Elective (2) - List 2	1	0	1	2	15	15	30	60	3
		12	**8**	**5**	**25**				**750**	

STUDY PLAN (Cont.)

THIRD YEAR
CIVIL ENGINEERING PROGRAM (GENERAL)

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
GENXXX	Elective (4) from University list	1	1	0	2	30	0	30	60	2
CIV300	Field Training (1) *	0	0	0	0	30	30	0	30	-
CIV310	Structural Analysis Using Computers	2	0	2	4	30	30	60	120	3
CIV311	Geotechnical Engineering	2	0	2	4	30	30	60	120	3
CIV313	Steel Structures (1)	2	3	0	5	75	0	75	150	3
CIV314	Hydraulics	2	2	0	4	60	0	60	120	3
CIV315	Transportation & Traffic Engineering (1)	3	3	0	6	75	0	75	150	3
		13	**8**	**4**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
GENXXX	Elective (5) from University list	1	1	0	2	15	15	30	60	2
CIV316	Highways and Airports Engineering (1)	2	2	0	4	30	30	60	120	3
CIV317	Geotechnical Engineering and Foundations (1)	2	1	2	5	45	30	75	150	3
CIV318	Reinforced Concrete (3)	2	2	0	4	60	0	60	120	3
CIV319	Irrigation Engineering	2	2	0	4	60	0	60	120	3
CIV330	Projects Management	3	3	0	6	90	0	90	180	3
		13	**9**	**3**	**25**				**750**	

* After completing the second year, the student undergoes Field Training 1(CIV300) for 4 weeks during the summer vacation, in a firm or project site in a related field. Every 5 students are supervised by a staff member of the department, (this supervision is not included in the staff member's teaching load).

STUDY PLAN (Cont.)

FOURTH YEAR
CIVIL ENGINEERING PROGRAM (GENERAL)

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
GENXXX	Elective (6) from University list	1	1	0	2	30	0	30	60	2
CIV400	Field Training (2) *	0	0	0	0	15	15	0	30	-
CIV410	Geotechnical Engineering and Foundations (2)	2	3	0	5	30	30	60	120	3
CIV411	Highways and Airports Engineering (2)	2	2	0	4	60	0	60	120	3
CIV412	Design of Irrigation Works	2	3	0	5	75	0	75	150	3
CIV413	Sanitary Engineering (1)	2	3	0	5	75	0	75	150	3
CIV414	Railway Engineering) 1)	2	2	0	4	60	0	60	120	3
		11	**14**	**0**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
GENXXX	Elective (7) from University list	1	1	0	2	15	15	30	60	2
CIV415	Design of Concrete Structures	2	2	0	4	60	0	60	120	4
CIV416	Steel Structures (2)	2	2	0	4	60	0	60	120	2
CIV490	Graduation Project**	0	0	10	10	150	150	0	300	-
CIV4xx	Elective (1) *** Civil Eng. (General) - List 1	1	2	0	3	45	0	45	90	3
CIV4xx	Elective (2) Civil Eng. (General) - List 2	2	0	0	2	30	0	30	60	3
		9	**6**	**10**	**25**				**750**	

* After completing the third year, the student undergoes Field Training 2 (CIV400) for 4 weeks during the summer vacation, in a firm or project site in a related field. Every 5 students are supervised by a staff member of the department, (this supervision is not included in the staff member's teaching load).

** After completing the second semester, the students are divided into groups and continue performing the graduation project for 4 weeks.

*** Elective (1) is in the same studying field as the graduation project.

LIST OF TECHNICAL LANGUAGES ELECTIVE COURSES

#	Code	Contact Hours	Contact Hrs			
			Lec.	Tut.	Lab.	Total
1	GEN010	English Language	2	0	0	2
2	GEN020	German Language	2	0	0	2
3	GEN020	French Language	2	0	0	2

LIST OF ELECTIVE COURSES FROM UNIVERSITY REQUIREMENTS

#	Code	Contact Hours	Contact Hrs			
			Lec.	Tut.	Lab.	Total
1	GEN900	Communication & Presentation Skills	1	1	0	2
2	GEN901	Theory of Sustainability	1	1	0	2
3	GEN902	Human Rights and Combating Corruption	1	1	0	2
4	GEN903	Research & Analysis Skills	1	1	0	2
5	GEN904	Entrepreneurship	1	1	0	2
6	GEN905	Professional Ethics	1	1	0	2
7	GEN906	Critical Thinking	1	1	0	2
8	GEN907	Human Resources Management	1	1	0	2
9	GEN908	Contracts and Legislation	1	1	0	2
10	GEN909	Method of Scientific Research and Writing	1	1	0	2

LIST OF COMPUTER ELECTIVE COURSES FOR CIVIL ENGINEERING PROGRAMS (COMMON)

#	Code	Contact Hours	Contact Hrs			
			Lec.	Tut.	Lab.	Total
List (1) of Computer Elective Courses						
1	CIV231	Computer Programing (1)	1	0	1	2
2	CIV232	Computer Aided Drawing (1)	1	0	1	2
List (2) of Computer Elective Courses						
1	CIV233	Computer Programing (2)	1	0	1	2
2	CIV234	Computer Aided Drawing (2)	1	0	1	2

LIST OF ELECTIVE COURSES FOR CIVIL ENGINEERING PROGRAM (GENERAL)

#	Code	Contact Hours	Contact Hrs			
			Lec.	Tut.	Lab.	Total
List (1) of Elective Courses						
1	CIV450	Sanitary Engineering (2)	2	1	0	3
2	CIV451	Special Topics in Water and Irrigation Resources	2	1	0	3
3	CIV452	Highway and Airport Engineering (3)	2	1	0	3
4	CIV453	Railway Engineering (2)	2	1	0	3
5	CIV454	Geotechnical Engineering and Foundations (3)	2	1	0	3
List (2) of Elective Courses						
1	CIV455	Advanced Project Management	2	0	0	2
2	CIV456	Transportation Planning and Traffic Engineering	2	0	0	2
3	CIV457	Environmental Engineering	2	0	0	2
4	CIV458	Harbor Engineering, Shoreline Protection and Internal Navigation	2	0	0	2
5	CIV459	Railway Planning	2	0	0	2

BENHA UNIVERSITY

CIVIL ENGINEERING- GENERAL PROGRAM 2021

FACULTY OF ENGINEERING AT SHOUBRA

CIVIL ENGINEERING PROGRAM (GENERAL)

	First Semester							Second Semester					
PREPARATORY YEAR	BAS010 **Differential Calculus and Algebra**	BAS011 **Differential Calculus and Algebra**	BAS012 **Engineering Chemistry**	BAS013 **Physics of Materials & Electricity**	MEC010 **Engineering Drawing (1) ×**	GEN010 **Technical English Language**	BAS014 **Integral Calculus & Analytical Geometry**	BAS015 **Dynamics**	BAS016 **Physics of Light, Heat and Magnetism**	MEC011 **Principles of Manufacturing Engineering†**	MEC012 **Engineering Drawing (2) ×**	GEN011 **Computer Skills ×**	GEN012 **History of Engineering & Technology**
FIRST YEAR	CIV100 Summer Training*	GED130 **Surveying (1)**	CIV110 **Structural Analysis (1)**	CIV111 **Materials science**	CIV112 **Geology science**	CIV113 **Economics and Statistics**	CIV114 **Civil Engineering Drawing*x**	**GENXXX Elective (1) from university list**	BAS114 **Numerical analysis and Operations Research**	ARC130 **Architectural Construction**	CIV115 **Structural Analysis (2)**	CIV116 **Properties Materials**	CIV117 **Engineering Math using computers**
SECOND YEAR	**GENXXX Elective (2) from university list**	CIV210 **Structural Analysis (3)**	CIV211 **Properties of Structural Materials (1)**	CIV212 **Reinforced Concrete (1)**	CIV213 **Fluid Mechanics**	CIV2xx **Computer Elective (1)- List 1**	**GENXXX Elective (3) from university list**	CIV215 **Structural Analysis (4)**	CIV216 **Properties of Structural Materials (2)**	CIV217 **Reinforced Concrete (2)**	CIV218 **Differential equations**	CIV2xx **Computer Elective (2) - List 2**	
THIRD YEAR	**GENXXX Elective (4) from university list**	CIV300 **Field Training (1) ***	CIV310 **Structural Analysis Using Computers**	CIV311 **Geotechnical Engineering**	CIV313 **Steel Structures (1)**	CIV314 **Hydraulics**	CIV315 **Transportation & Traffic Engineering (1)**	**GENXXX Elective (5) from university list**	CIV316 **Highways and Airports Engineering (1)**	CIV317 **Geotechnical Engineering and Foundations (1)**	CIV318 **Reinforced Concrete (3)**	CIV319 **Irrigation Engineering**	CIV330 **Projects Management**

FOURTH YEAR	GENXXX Elective (6) from university list	CIV400 Field Training (2)*	CIV410 Geotechnical Engineering and Foundations (2)	CIV411 Highways and Airports Engineering (2)	CIV412 Design of Irrigation Works	CIV413 Sanitary Engineering (1)	CIV414 Railway Engineering) 1)	GENXXX Elective (7) from university list	CIV415 Design of Concrete Structures	CIV416 Steel Structures (2)	CIV490 Graduation Project**	CIV4xx Elective (1)* Civil Engineering (General) - List 1	CIV4xx Elective (2) Civil Engineering (General) - List 2

Elective Courses	CIV231 Computer Programing (1)	CIV232 Computer Aided Drawing (1)	CIV233 Computer Programing (2)	CIV234 Computer Aided Drawing (2)

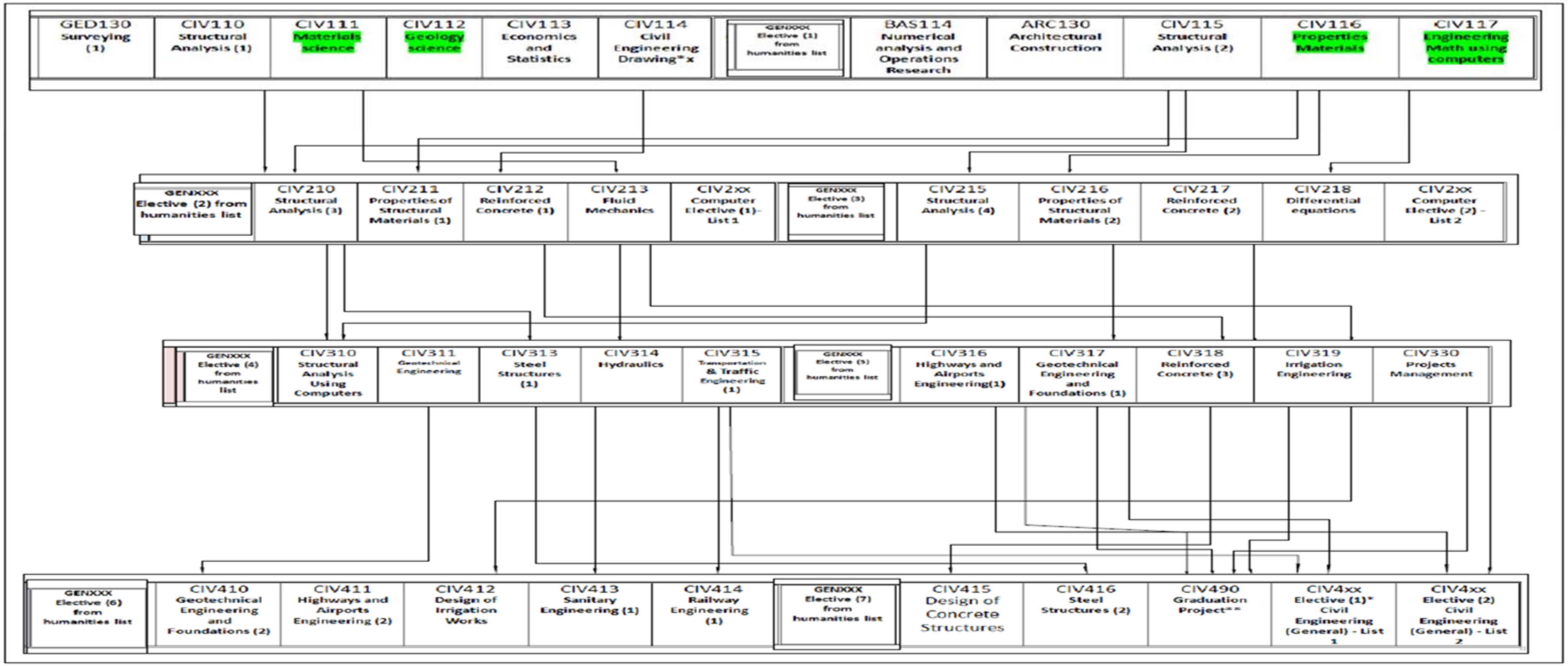
Elective Courses	CIV450 Sanitary Engineering (2)	CIV451 Special Topics in Water and Irrigation Resources	CIV452 Highway and Airport Engineering (3)	CIV453 Railway Engineering (2)	CIV454 Geotechnical Engineering and Foundations (3)	CIV455 Advanced Projects Management	CIV456 Transportation Planning and Traffic Engineering	CIV457 Environmental Engineering	CIV458 Harbor Engineering, Shoreline Protection and Internal Navigation	CIV459 Railway Planning

CIVIL ENGINEERING- GENERAL PROGRAM
2021

BENHA UNIVERSITY

FACULTY OF ENGINEERING AT SHOUBRA

CIVIL SYSTEMS ENGINEERING PROGRAM TREE



		Course name	Civil-General Program Competencies																				
			level A (NARS 2018)										Level C(NARS 2018)				Level C(ARS)						
			A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6	C7
PREP. YEAR	BAS010	Differential Calculus and Algebra	√							√													
	BAS011	Statics	√			√				√													
	BAS012	Engineering Chemistry	√	√					√	√													
	BAS013	Physics of Materials & Electricity	√	√					√	√													
	MEC010	Engineering Drawing (1) ×	√					√		√													
	GEN010	Technical English Language	√	√						√	√												
	BAS014	Integral Calculus & Analytical Geometry	√							√													
	BAS014	Dynamics	√			√	√			√													
	BAS016	Physics of Light, Heat and Magnetism	√	√					√	√													
	MEC011	Principles of Manufacturing Engineering	√	√				√		√		√											
	MEC012	Engineering Drawing (2) ×	√			√				√													
	GEN011	Computer Skills ×	√	√						√		√											
	GEN012	History of Engineering & Technology	√		√					√	√												

FIRST YEAR CIVIL	CIV 100	Summer Trianing					√		√	√		√											
	GED130	Surveying (1)	√										√										
	CIV110	Structural Analysis (1)	√				√						√										
	CIV111	Materials science (1)	√				√						√										
	CIV112	Geology Science	√	√					√	√													
	CIV113	Economics and Statistics	√	√						√	√	√											
	CIV114	Civil Engineering Drawing*x	√		√					√			√	√									
	GEN110	Communication and Presentation Skills							√	√		√											
	BAS114	Numerical Analysis and Operations Research	√	√			√				√	√											
	ARC130	Architectural Construction				√			√				√		√								
	CIV115	Structural Analysis (2)	√	√			√						√										
	CIV116	Materials science (2)	√				√						√										
	CIV117	Engineering math using computer	√	√						√		√											
SECOND YEAR CIVIL	GEN 210	Human Rights and Combating Corruption							√	√		√											
	CIV210	Structural Analysis (3)				√		√	√	√	√	√			√	√							
	CIV211	Properties of Structural Materials (1)	√	√			√						√										
	CIV212	Reinforced Concrete (1)	√	√			√						√										
	CIV213	Fluid Mechanics				√								√									
	CIV2xx	CIV 231 Computer Programing (1)	√	√			√						√										
		CIV 232 Drawing using computer (1)	√							√		√											
	GEN211	Research and Analysis Skills	√							√		√											
	CIV215	Structural Analysis (4)		√			√				√	√											

	CIV216	Properties of Structural Materials (2)	√	√			√						√										
	BAS 218	Differential Equations	√	√			√						√										
	CIV217	Reinforced Concrete (2)	√			√								√									
	CIV2xx	CIV 233 Computer Programing (2)	√							√													
		CIV 234 Drawing using computer (2)	√							√		√											
	CIV200	Field training (1)	√							√		√											
THIRD YEAR CIVIL(General)	GEN312	Contracts and Legislations			√			√	√	√	√	√				√							
	CIV310	Structural Analyses Using Computers		√									√										
	CIV311	Geotechnical Engineering	√	√	√	√							√	√								√	
	CIV313	Steel Structures (1)				√								√									
	CIV314	Hydraulics	√	√						√			√	√			√				√		
	CIV315	Transportation and Traffic Engineering (1)	√	√	√	√								√				√	√				
	GEN311	Professional Ethics			√	√			√	√						√							
	CIV316	Highways and Airports Engineering (1)	√	√	√	√								√				√	√				
	CIV317	Geotechnical Engineering and Foundations (1)	√	√	√	√							√	√								√	
	CIV318	Reinforced Concrete (3)				√							√										
	CIV319	Irrigation and Drainage Engineering	√	√	√	√							√	√							√		
	CIV330	Projects Management	√	√	√	√							√	√		√							√
	CIV300	Field trianing (2)				√		√	√	√	√	√			√	√							
FOURTH	GEN410	Critical Thinking							√	√	√	√											
	CIV410	Geotechnical Eng. and Foundations (2)	√	√	√	√							√	√								√	
	CIV411	Highways and Airports Engineering (2)	√	√	√	√								√				√					
	CIV412	Design of Irrigation Works	√	√	√	√							√	√							√		

	CIV413	Sanitary Engineering (1)	√	√	√	√								√			√						
	CIV414	Railway Engineering (1)	√	√	√	√								√						√			
	GEN411	Human Resources Management						√	√	√	√	√			√								
	CIV415	Reinforced Concrete (4)				√							√										
	CIV416	Steel Structures (2)				√								√									
	CIV4xx ELECTIVE(1) list 1	CIV450 Sanitary Engineering (2)	√	√	√	√								√			√						
		CIV451 Special Topics in Water Resources and Irrigation	√	√	√	√							√	√							√		
		CIV452 Highways and Airports Engineering (2)	√	√	√	√								√				√					
		CIV453 Railway Engineering (2)	√	√	√	√								√						√			
		CIV454 Geotechnical Eng. and Foundations (3)	√	√	√	√							√	√								√	
	CIV4xx ELECTIVE (2) list 2	CIV455 Advanced Projects Management				√		√		√					√	√							√
		CIV456 Transportation and traffic planning	√	√	√	√								√					√				
		CIV457 Environmental Engineering	√	√	√	√								√			√						
		CIV458 Port engineering, beach protection and navigation	√	√	√	√							√	√									
		CIV459 Railway Planning	√	√	√	√								√						√			
	CIV491	Graduation Project				√	√	√	√	√	√	√			√	√	√	√	√	√	√	√	√

Courses Description

PREPARATORY YEAR

BAS010 Differential Calculus and Algebra (2,2,0)

Differentiation: Elementary functions, Polynomials, Exponential, Logarithmic and trigonometric functions, Limits and continuity, Derivative, Implicit differentiation, Maximum and minimum values, Mean value theorem, Taylor's expansion, Integration of Polynomials, Exponential and trigonometric functions, Definite integral.
Algebra: Matrices, Algebra of matrices, Eigenvalues and eigenvectors, Positive and negative matrices, Linear systems, Finite series, Complex numbers, Mathematical induction.
References:

1- Basic Technical Mathematics with Calculus Kindle Edition, Pearson; 11th Edition, 2017.
2- Textbook of Basic Mathematics: A Beginner's Guide to Geometry, Trigonometry and Calculus, Kindle Edition, 2017.

BAS011 Statics (2,1,2)

Application on space vectors, resultant of a set of forces, moments, equivalent couple moment, equations of equilibrium for rigid body, types of supports, statically determinate beams and trusses, equilibrium under influence of spatial forces and couples, center of mass (for particles and planer surface), moment of inertia (parallel axes, major axes, planer surface).
References:

1- Engineering Mechanics: Statics & Dynamics by Russell Hibbeler, Pearson; 14th Edition, 2015.

BAS012 Engineering Chemistry (2,1,2)

Gaseous state (gases law), chemical equilibrium and Le Chatellier, principle –solutions- phase diagram- basics of water treatment and desalination technology- Introduction on thermo-chemistry and its rules, basics of fuel combustion, calorimetric and determination of heat of combustion –Electrochemistry and conduction in electrolytic solutions. Electrochemical cells and Nernst equation- Corrosion of metals (types, methods of prevention of corrosion – ionic equilibrium and pH calculation- building materials and some petrochemicals industry.
References:

1- Engineering Chemistry: Alpha Science; Illustrated Edition, 2018

BAS013 Physics of Materials & Electricity (2,1,2)

Properties of matter : Physical quantities, standard units and dimensions, atomic structure (electronic distribution, classification of elements and energy levels), crystalline structure (crystalline grid, symmetry, vacuum groups, some simple examples of crystalline structure), stress and strain, mechanical properties of materials (tensile strength and yield stress, etc.,) Physical properties of liquids, viscosity, surface tension, Archimedes principles, Pascal's law, Bernouli's equation and their applications. Laboratory experiments. Electrical: charge and matter, Coulomb's law, electric field, Gauss's law, electric potential, capacitors and dielectric materials, electrical resistance and electromotive force, Ohm's law, simple electrical circuit, laboratory experiments.

References:

1- Modern Classical Physics: Optics, Fluids, Plasmas, Elasticity, Relativity, and Statistical Physics by Kip S. Thorne , Princeton University Press, 2017.
2- Basic Physics: A Self-Teaching Guide by K Kuhn, Noah Books, 2018.

MEC010 Engineering Drawing (1) (0,3,0)

This is an introductory course teaches the basics of technical Drawing using manual drafting instruments. The topics include drawing tools, types of lines, sizes and layout of standard drawing sheets, lettering & numbering, scale use, drawing of geometrical figures, dimensioning, axonometric and isometric views, orthogonal and auxiliary projections, drawing of orthographic projection from isometric view.

References:

1- A Textbook of Engineering Drawing: Along with an Introduction to AutoCAD 2015 by Roop Lal, I K International Publishing House, 2015.

GEN0X0 Technical Language (2,0,0)

Characteristics of the English or French or German technical language, grammar review, effective sentences and their characteristics, identify some common mistakes in the writing of technical sentence, paragraph construction, types of paragraphs, development of communication skills by reading and analysis of excerpts from technical writing in various engineering disciplines such as mechanical, electrical, civil ... etc.

References:

1- Mark Hancock & Annie McDonald, English Result - Intermediate Level, Oxford University press, Last Edition.
2- Durrell, Martin, "Using German: A guide to contemporary usage / Martin Durrell", Cambridge, U.K.; New York: Cambridge University Press, 2003.
3- Coffman Crocker, Mary E, " Schaum's outline of French grammar", McGraw-Hil, Schaum's outline series, 1999, 4th ed.

BAS014 Integral Calculus and Analytical Geometry (2,2,0)

Integration: Hyperbolic functions and inverse functions and their derivatives, derivatives of parametric relations, Methods of integrations, integration by partial fractions, parts, reduction and substitution, Applications of definite integrals for obtaining plane area, volumes, arc length and surface area.

Analytical geometry: Cartesian and polar coordinates, Equation of pair of lines, Equation of circle, Conic sections and their properties, Equation of plane, Equations of sphere, cone and cylinder.

References:

1- Basic Technical Mathematics with Calculus, Kindle Edition, Pearson; 11th Edition, 2017.
2- Textbook of Basic Mathematics: A Beginner's Guide To Geometry, Trigonometry and Calculus, Kindle Edition, 2017.

BAS015 Dynamics (2,1,2)

Kinematics of Particle (rectilinear and curvilinear motion, Cartesian coordinates, projectile motion, natural coordinates, polar coordinates, relative motion), kinetics of Particle (acceleration force method), plane kinematics of rigid bodies (translational and rotational motion, general motion: relative velocities, instantaneous center of zero velocity, planer kinetics of rigid body, acceleration forces, work and energy, impact and momentum.

References:

1- Engineering Mechanics: Statics & Dynamics by Russell Hibbeler, Pearson; 14th Edition, 2015.

BAS016 Physics of Light, Heat and Magnetism (2,1,2)

Principles of heat and thermodynamics: Zero law, first and second Law of thermodynamics, heat transfer, gas theory, temperature measurement methods. Light and laser physics: general concepts of light, straight diffusion of light, Velocity of light diffusion, light beam, optical beams, geometric light, reflection and refraction, wave radiation modeling, wave dissipation, diffraction of light, introduction to lasers, Einstein's equations and magnification Light, Explanation of some lasers (gas, solid and liquid lasers), laser applications. Magnetism: magnetic field, Faraday magnetic law, magnetic induction, Boit-savart's law, Ampere's law, laboratory experiments.

References:

1- Modern Classical Physics: Optics, Fluids, Plasmas, Elasticity, Relativity, and Statistical Physics by Kip S. Thorne , Princeton University Press, 2017.
2- Basic Physics: A Self-Teaching Guide by K Kuhn, Noah Books, 2018

MEC011 Principles of Manufacturing Engineering (1,0,2)

The course introduces the basic concepts of production and productivity. The topics include classification of production processes, industrial safety, engineering materials, ferrous and non-ferrous alloys, steel and its types, cast iron and its types, steel and cast iron production, metal casting processes (sand casting, mold casting, centrifugal casting, wax casting, hot and cold metal forming processes (extrusion, forging, rolling, deep drawing, wire drawing, etc.), metal cutting processes (turning, milling, shaping, drilling, grinding, etc.),metal joining techniques (welding processes, rivets, bolts … etc).Simple workshop measuring tools (Vernier caliper, micrometers, etc.), practical skills in workshops.

References:

1- Workshop Technology (Manufacturing Process) by S. K. Garg, Laxmi Publications; 3rd Revised edition, 2009.

MEC012 Engineering Drawing (2) (0,3,1)

Deduction of the missing orthogonal views, sections in machine members, hatching rules, intersections of solids and surfaces, development of surfaces, drawing of steel structures. Basics of computer aided drafting (CAD) using AutoCAD: Workspace, toolbars, coordinate systems, setting up 2D drawing environment, drawing tools in AutoCAD, object snap, modification tools in AutoCAD, texting and dimensioning in AutoCAD.

References:

1- A Textbook of Engineering Drawing: Along with an Introduction to AutoCAD 2015 by Roop Lal, I K International Publishing House, 2015.

GEN011 Computer Skills (1,0,1)

IT concepts and terminology, Computer hardware, operating systems, Computer networks, Internet, Computer graphics, Multimedia systems, Databases. Practical applications: Operating system (Microsoft Windows), Word processing (Microsoft Word), Spreadsheets (Microsoft Excel), Microsoft PowerPoint, Databases (Microsoft Access). Introduction to programming concepts, programming languages and their classification, logical design of programs and algorithms, structural programming and object-oriented programming.

References:

1- Practice using ICDL components

GEN012 History of Engineering and Technology (2,0,0)

The definition of science, technology, engineering and architecture. The development of civilizations and their relationship to human sciences (ancient Egyptian civilization, Roman and Greek civilization, Mesopotamia, dark ages, industrial revolution). Different engineering disciplines and their role in society. The historical relationship between science and technology. The relationship between the development of engineering, the social and economic development of the environment, the challenges of globalization and the new economy. The contribution of engineers in the new millennium, the issues of economic and industrial development in Egypt.

References:

1- James E. McClellan & Harold Dorn, Science and Technology in World History: An Introduction, The Johns Hopkins University Press, 2nd. Ed., 2006.
2- Richard Shelton Kirby, Engineering in History, Dover publications, 1990.

FIRST YEAR

CIV100 Summer Training (Civil Engineering Drawing)

Training duration: 3 weeks (5 days per week for 5 hours a day) with a total of 75 training hours (5 hours X 15 days), with the following contents: Introduction to civil drawing using AutoCAD program- 2D drawing tools in the program- Training and applications- Training mark will be calculated as (20 marks) and will be added to the semester work marks of Civil Engineering Drawing (CIV 114).

References:

1- G. L. Asawa (2008). “Irrigation and Water Resources Engineering”. New Age International (P) Limited, New Delhi.
2- Adrian Laycock (2007). “Irrigation Systems – Design, Planning and Construction”. Cromwell Press, UK.
3- N. N. Basak (2007). “Irrigation Engineering”. Tenth Reprint, Tata McGraw-Hill Publishing Company Limited, New Delhi.
4- Manual of Steel Construction, Load and Resistance Factor Design, American Institute of -Steel Construction (AISC), 2010.

GED130 Surveying (1) (2,0,2)

Definitions - Linear surveying - Normal and grid drawing scale - Compass surveying- Balanchite survey - Surveying devices (Scale - Theodolite - Tachometer) - Methods of determining the level difference – Bench Marks - Leveling errors - Leveling tables - Longitudinal and transverse sections and the shown data – Networks, errors and correction - Design and layout of curves.

References:

1- James M. Anderson and Edward M. Mikhail, 1998: Surveying Theory and Practice.
2- Andrew L. Harbin, 2001: Land Surveyor Reference Manual
3- W. Schofield and M. Breach, 2007: Engineering Surveying
4- S.K. Husain, M.S. Nagaraj, 1992: Textbook of Surveying, fifth revised addition, S.Chand & Company LTD, Ram Nagar, New Delhi-110055.

CIV110 Structural Analysis (1) (2,2,0)

Introduction to statics - Types of structures and loads - Types of supports and reactions - Analysis of beams and frames under the effect of concentrated loads - Stability and statically determinacy of structures - Study and analysis of trusses and frames - Normal forces, shear forces and bending moments in beams and frames subjected to concentrated loads.

References:

1- Course Notes and Solved Examples Prepared by the staff
2- El.Dakhakhny, W.M., “Theory of Structures”, Part I & II, 9th edition, Dar-Al-Maaref, Cairo, Egypt, 1995, ISBN: 977-02-4790-1

3- Beer, F., Johnston, R.E., Dewolf, J.T., and Mazurek D., “Statics and Mechanics of Materials”, 3rd edition, Prentice Hall; 896 pages, ISBN 978-0132166744, 2010.

CIV111 Materials Sciences (2,0,3)

Specifications and standard tests – Engineering materials – Microstructure and crystal structure of materials – Mechanical properties of metals and steel reinforcement – Testing of metals and steel reinforcement – Deformation, cracking toughness and failure of brittle and ductile materials Strengthening and toughening of materials – Toughness of metals – Timber – Alloys – Fibers – Polymers – Fiber Reinforced Polymers – Types of metal failures – Fatigue, creep and corrosion in metals.

References:

1- Egyptian code, third appendix, Laboratory testing of concrete materials
2- Egyptian code for design and construction of reinforced concrete buildings
3- المواصفات القياسية المصرية م ق م 262-2/2015 "الصلب المستخدم في تسليح الخرسانة" 2015
4- خواص المواد واختباراتها الجزء الأول أ.د/ محمود إمام 2007
5- David Roylance ‘Mechanical Properties of Materials’ 2008.
6- American Society for Testing and Materials (ASTM)
7- Ilson, J.M, "Construction Materials, Their nature and behavior", ISBN 0-419-25860
8- Sonayaji, "Civil Engineering Materials", ISBN 0-13-177643-6

Web Sites:

1- https://www3.nd.edu/~amoukasi/CBE30361/Lecture_Mecahnical_Failure_2014.pdf
2- www.uh.edu/~hfang2/MECE3345/Lectures/Chapter8.pdf
3- https://mechanicalc.com/reference/mechanical-properties-of-materials#note-strain-hardening-exponent
4- https://www.tec-science.com/material-science.

CIV112 Geology Science (2,2,0)

Principles of engineering geology – Minerals: physical properties and chemical characteristics – Types of rocks forming Earth’s crust – Engineering properties and engineering classification of rocks – Geological processes that affect soil formation – Soil and its physical properties – Groundwater – Internal geological processes affecting Earth’s crust morphology (earthquakes and volcanoes) – Geological structures (folds and faults) – Contour and geological maps and associated geological sections.

References:

1- Foundations of Engineering Geology, Tony Waltham, Taylor and Francis Group, 2009
2- Engineering Geology: Principles and Practice, David G. Price, Springer, 2009
3- Engineering Geology, F.G. Bell, Elsevier Science, 2007.
4- Geological Structures and Maps, Richard J. Lisle, Elsevier Science, 2004.

CIV113 Economics and Statistics (2,2,0)

The basics of capital management - Accounting methods - Financial disclosures – Assembling and analysis - Accounting forms for construction projects - Companies and projects evaluation - Re-risk relationships – Financial forecasting and analysis- Project financing - Contracts financing and financial options- Descriptive statistics and probabilities - Frequency distributions and hypothesis tests - Logic analysis and relationships.

References:

1- Niall M. Fraser and Elizabeth M. Jewkes (2013), "Engineering Economics: Financial Decision Making for Engineers." Fifth Edition by. Pearson Education Canada, ISBN 978-0-13-237925-0, 2013.

CIV114 Civil Engineering Drawing (1,2,1)

Steel structures drawings: Steel sections - Steel elements – Steel connections - Details of beams with steel plates - Foundations - Irrigation structures drawings: Syphons - Arches – Weirs - Culverts- Using computer applications in civil drawing.

References:

1- G. L. Asawa (2008). "Irrigation and Water Resources Engineering". New Age International (P) Limited, New Delhi.
2- Adrian Laycock (2007). "Irrigation Systems – Design, Planning and Construction". Cromwell Press, UK.
3- N. N. Basak (2007). "Irrigation Engineering". Tenth Reprint, Tata McGraw-Hill Publishing Company Limited, New Delhi.

BAS114 Numerical Analysis and Operations Research (3,3,0)

Numerical analysis: Numerical methods for solving equations of one variable – Numerical methods for solving linear and nonlinear systems – Numerical integration and differentiation – Curve fitting – Interpolation by finite differences, divided differences and Lagrange's method – Numerical methods for solving ordinary differential equations.

Operations research: Introduction to operations research, Methods of solution – Linear programming problems – Problem formulation – Graphical method – Simplex method – Two phase method – Dual problems.

References:

1) Numerical Analysis, R.L.Burden & J.D. Faires, Brooks/Cole Cengage Learning, U.S.A, 2005.

2) Operations Research, 8th Edition, Hamdy A. Taha, Pearson Prentice Hall, New Jersey, U.S.A, 2007.

ARC130 Architectural Construction (1,2,0)

Architectural construction details: Sections - Elevations - Stairs - Insulation and protection layers – Doors and windows - Ceilings - Floors - Paints - Rain drainage - Electrical connections for prefabricated units - Structural systems for buildings with load-bearing walls.

References:

1- Ramsey, Sleeper Architectural Graphic Standards, Wiley, Latest Ed.
2- Mitchell, Building Construction, Batsford, Latest Ed.
3- McKay's, Building Construction, Volume One, Longmans, Latest Ed.

CIV115 Structural Analysis (2) (2,2,0)

Uniformly and non-uniformly distributed loads - Relationship between loads, shear forces and bending moments for beams and frames under the effect of uniformly and non-uniformly distributed loads - Normal stresses and strains due to axial loads - Normal stresses due to bending moments - Normal stresses due to the combination of axial force and bending moment.

References:

1- Course Notes and Solved Examples Prepared by the Instructors
2- El.Dakhakhny, W.M., “Theory of Structures”, Part I & II, 9th edition, Dar-Al-Maaref, Cairo, Egypt, 1995, ISBN: 977-02-4790-1
3- Beer, F., Johnston, R.E., Dewolf, J.T., and Mazurek D., “Statics and Mechanics of Materials”, 3rd edition, Prentice Hall; 896 pages, ISBN 978-0132166744, 2010.

CIV116 Properties of materials (2,0,3)

Cement (Methods of manufacture – Types – Hydration – Properties – Tests) – Natural and artificial aggregates (Types, Properties – Tests) – Chemical and mineral admixtures (Types – Properties – Tests) – Cement replacement materials – Conformance of concrete materials – Properties and testing of fresh concrete.

References:

1- Egyptian code, third appendix, Laboratory testing of concrete materials
2- Egyptian code for design and construction of reinforced concrete buildings
3- المواصفات القياسية المصرية م ق م 262-2/2015 "الصلب المستخدم في تسليح الخرسانة" 2015
4- خواص المواد واختباراتها الجزء الأول أ.د/ محمود إمام 2007
5- David Roylance ‘Mechanical Properties of Materials’ 2008.
6- American Society for Testing and Materials (ASTM)

7- Ilson, J.M, "Construction Materials, Their nature and behavior", ISBN 0-419-25860
8- Sonayaji, "Civil Engineering Materials", ISBN 0-13-177643-6

Web Sites:

1- https://www3.nd.edu/~amoukasi/CBE30361/Lecture_Mecahnical_Failure_2014.pdf
2- www.uh.edu/~hfang2/MECE3345/Lectures/Chapter8.pdf
3- https://mechanicalc.com/reference/mechanical-properties-of-materials#note-strain-hardening-exponent
4- https://www.tec-science.com/material-science/

CIV117 Engineering Math Using Computers (1,0,4)

Computer applications in the fields of: Programming - Databases – Developing documents - Developing engineering diagrams and drawings- Applications in mathematical calculations.

References:

1. Engineering with Excel, Ronald W. Larsen, 4th_Edition, PEARSON.
2. Excel VBA Programming for Dummies, John Walkenbach, 3th_Edition, John Wiley & Sons, Inc.
3. Step-By-Step Optimization with Excel Solver – The Excel Statistical Master, Mark Harmon, Excel Master Series.
   Data Analysis with Excel, Tutorials Point (I) Pvt. Ltd.

SECOND YEAR

CIV210 Structural Analysis (3) (3,3,0)

Shear stresses in beams - Shear stresses under the effect of twisting moments on circular, non-circular and tubular sections - Shear flow and shear center - Bolted and welded connections - Stresses under combined load conditions – Principal normal and shear stresses and use of Mohr's circle – Deflection of beams using double integration method, singularity function and conjugate beam method - Applications for solving statically indeterminate beams using separation and compositing method.

References:

1- Course Notes and Solved Examples Prepared by the Instructors
2- El.Dakhakhny, W.M., "Theory of Structures", Part I & II, 9th edition, Dar-Al-Maaref, Cairo, Egypt, 1995, ISBN: 977-02-4790-1
3- Beer, F., Johnston, R.E., Dewolf, J.T., and Mazurek D., "Statics and Mechanics of Materials", 3rd edition, Prentice Hall; 896 pages, ISBN 978-0132166744, 2010.
4- Hibbeler, R.C., "Statics and Mechanics of Materials", 3rd edition, Prentice Hall; 896 pages, ISBN 978-0132166744, 2010
5- Hibbeler, R.C., "Structural Analysis", 9th edition, Prentice Hall; 720 pages, ISBN 978-0133942842, 2014
6- McCormac, J.C., "Structural Analysis: Using Classical and Matrix Methods", 4th edition, Wiley, 620 pages; 2012.

CIV211 Properties of Structural Materials (1) (2,1,2)

Design of concrete mixes using the British and American methods – Quality control of concrete production on site – Curing of concrete and its effect on properties – Revision on testing of fresh and hardened concrete and factors affecting the results – Non-Destructive tests on structures – Schmidt Hammer test – Ultra Sonic Pulse Velocity test - Core test – Loading test for structural members.

References:

1- American Society for Testing and Materials (ASTM).
2- Aitcin, P.C., High Performance Concrete, Properties and Applications, McGraw Hill, Inc., 1994.
3- Neville, A. M., Properties of Concrete, Longman, England, 1998.
4- ACI, Manual, American Concrete Institute, 1998.
5- Mehta, P.K., Properties of Concrete and Structures, Prentice Hall Inc., New Jersey, 1998.
6- Neville, A., Properties of Concrete, Longman, 1998.
7- ECCS 203-2001 Egyptian Code for Design and Construction of Concrete Structures, Ministry of Housing, Utilities and Urban Communities, Giza, Egypt, 2007.

8- Lecture Notes, Staff of Properties, Testing of Materials and Quality Control Laboratory, 2003.
9- Egyptian Standard Specifications, ESS ,المواصفات القياسية المصرية للمواد, وزارة الصناعة

CIV212 Reinforced Concrete (1) (3,3,0)

Statical systems and load distribution- Cases of loadings- Maximum- maximum internal forces- Ultimate limit state design method- Analysis and design of rectangular, T and L-sections under flexure, shear and torsion- Development and anchorage lengths- Integrated design and reinforcement detailing for simple and continuous beams. Design has to be done according to the Egyptian code for design of reinforced concrete structures.

References:

1- Lecture notes and handouts prepared by the staff.
2- ECP 203-2020 Egyptian Code for Design and Construction of Concrete Structures. Ministry of Housing, Utilities and Urban Communities, Giza, Egypt.
3- Design aids of the Egyptian code for RC structures.
4- Egyptian code for standard reinforcement detailing.
5- Design of concrete structures by A.H. Nilson, 2016.
6- Reinforced concrete: mechanics and design by J.G. MacGregor.
7- Design of reinforced concrete structures- Vol. 1 and Vol 2 by M. Ghoneim.

CIV213 Fluid Mechanics (2,2,0)

Properties of fluids - Fluid Pressure - Hydrostatic Pressure on Plan Surfaces - Force on Curved Gates, and Buoyancy - Stability of Floating Bodies - Relative Equilibrium of Liquids - Fluid Kinematics - Fluid Dynamics - Momentum Equation and its Applications - Flow in Pipe Lines - Pipes in Series& in Parallel - Dimensional Analysis - Similarity

References:

1- Finnemore, E.J. and Franzini, J.B., 2013. Fluid mechanics with engineering applications tenth edition.
2- T. Al-Shemmeri (2012). “Engineering Fluid Mechanics”. Ventus Publishing ApS and bookboon.com
3- Gerhart, P.M., Gerhart, A.L. and Hochstein, J.I., 2016. Munson, Young and Okiishi's Fundamentals of Fluid Mechanics. John Wiley & Sons.

CIV231 Computer Programing (1) (1,0,1)

Visual Basic: Fundamentals of programming - Input and output - Repetitive and vector operations- Control commands – Parentheses - Partial program - Training in writing engineering programs.

References:

1- Autodesk Official Training Guide, Learning AutoCAD 2019/2020

CIV232 Computer Aided Drawing (1) (1,0,1)

AutoCAD: Drawing commands - Modification (editing) and questioning commands - Display control - Layers and line types - Drawing aids - Grouped units - Dimensions and hatching - Printing- Working in networks.

References:

1- Autodesk Official Training Guide, Learning AutoCAD 2019/2020

CIV215 Structural Analysis (4) (2,2,1)

Deformations for statically determinate structures using the method of virtual work - Statically indeterminate structures - Analysis of statically indeterminate structures using the method of Virtual work- Three-moment equation method- Buckling of columns– Influence lines for statically determinate structures.

References:

1- Course Notes and Solved Examples Prepared by the staff
2- El.Dakhakhny, W.M., "Theory of Structures", Part I & II, 9th edition, Dar-Al-Maaref, Cairo, Egypt, 1995, ISBN: 977-02-4790-1
3- Beer, F., Johnston, R.E., Dewolf, J.T., and Mazurek D., "Statics and Mechanics of Materials", 3rd edition, Prentice Hall; 896 pages, ISBN 978-0132166744, 2010.
4- Hibbeler, R.C., "Statics and Mechanics of Materials", 3rd edition, Prentice Hall; 896 pages, ISBN 978-0132166744, 2010
5- Hibbeler, R.C., "Structural Analysis", 9th edition, Prentice Hall; 720 pages, ISBN 978-0133942842, 2014
6- McCormac, J.C., "Structural Analysis: Using Classical and Matrix Methods", 4th edition, Wiley, 620 pages; 2012.

CIV216 Properties of Structural Materials (2) (2,0,3)

Microstructure of hardened concrete (phases and types of pores) and their effect on properties – Factors affecting permeability of hardened concrete - Measurement methods and how to improve permeability – Durability – Mechanisms of deterioration of hardened concrete in different service conditions and methods of protection - Reasons and factors affecting the volume changes in hardened concrete (elastic deformation – Deformation due to temperature changes – Shrinkage – Creep) and the effect of these changes on structures and their measurement methods.

References:

1- American Society for Testing and Materials (ASTM).

2- Aitcin, P.C., High Performance Concrete, Properties and Applications, McGraw Hill, Inc., 1994.
3- Neville, A. M., Properties of Concrete, LONGMAN, England, 1998.
4- ACI, Manual, American Concrete Institute, 1998.
5- Mehta, P.K., Properties of Concrete and Structures, Prentice Hall Inc., New Jersey, 1998.
6- Neville, A., Properties of Concrete, Longman, 1998.
7- ECCS 203-2001 Egyptian Code for Design and Construction of Concrete Structures, Ministry of ousing, Utilities and Urban Communities, Giza, Egypt, 2007.
8- Lecture Notes, Staff of Properties, Testing of Materials and Quality Control Laboratory, 2003.
9- Egyptian Standard Specifications, ESS, المواصفات القياسية المصرية للمواد, وزارة الصناعة, أخر إصدار

CIV217 Reinforced Concrete (2) (3,0,3)

Design issues for shear fraction, punching shear, corbels and bearing strength -Design of short columns under axial and eccentric loads- Analysis and design of one way and two-way solid slabs under all types of loads- Design of paneled beams system- Serviceability limit states for deflection of beams. Design has to be done according to the Egyptian code for design of reinforced concrete structures.

References:

1- Lecture notes and handouts prepared by the staff;
2- ECP 203-2017 Egyptian Code for Design and Construction of Concrete Structures, Ministry of Housing, Utilities and Urban Communities, Giza, Egypt;
3- Design aids of the Egyptian code for RC structures;
4- Egyptian code for standard reinforcement detailing;
5- Design of concrete structures by A.H. Nilson, 2016;
6- Reinforced concrete: mechanics and design by J.G. MacGregor, 2016; and
7- Design of reinforced concrete structures- Vol. 1 and Vol 2 by M. Ghoneim.

CIV218 Differential Equations (2,3,0)

Multi variable functions- partial differentiation – maximum and minimum values – boundaries – curvature – multiple differentiation – ordinary differential Equations from first-degree and higher degrees – vector analysis.

References:

1- Differential Equations and Linear Algebra (Gilbert Strang), Wellesley-Cambridge; UK ed. Edition,2014.
2- Elementary Differential Equations and Boundary Value Problems by William E. Boyce et al., Wiley; 11th Edition, 2017.

CIV233 Computer Programing (2) (1,0,1)

Programming applications for network design, transportation, and geotechnical engineering.

References:

1- Autodesk Official Training Guide, Learning AutoCAD 2019/2020

CIV234 Computer Aided Drawing (2) (1,0,1)

REVIT: Drawing - Modification and questioning commands - Display control - Layers and line types - Drawing aids - Linking with structural analysis software.

References:

1- Autodesk RIVIT 2010, 2009.

THIRD YEAR

CIV300 Field Training (1) (0,0,0)

Duration of training: four weeks with a total of 160 training hours (8 hours per day x 5 days x 4 weeks. The student performs field training during the summer period outside the faculty in one of the factories, institutions or companies related to the field of specialization (governmental or private sector); under the supervision of the staff members in the department (one staff member for every five students). At the end of the training period, the student is required to submit a detailed report and is orally examined by the supervisors.

References:

1- Kumar Neeraj Jha (2011). Construction Project Management: Theory and Practice, Pearson Education India, 2011.

CIV310 Structural Analysis Using Computers (2,0,2)

Revision of programming basics - Computer-based structural analysis of plane and space trusses - Plane frames and grillage beams using stiffness method – Moment distribution method.

References:

1- Course Notes and Solved Examples Prepared by the Instructors
2- Dawe, D.J., "Matrix and Finite Element Displacement Analysis of Structures", Clarendon Press, 1984, ISBN: 0-19-856211-X
3- McGuire, W. and Gallagher, R.H., "Matrix Structural Analysis", John Wiley & Sons, 1986, ISBN: 0-471-03059-7
4- Shaker, A. "Plane Analysis of Indeterminate Structures", Ain Shams University Press, 1976
5- Nour, M. A., "Matrix Structural Analysis", Dar El Maarefah, 2008, ISBN: 977-5423-66-X

CIV311 Geotechnical Engineering (2,0,2)

Introduction to geotechnical engineering and its applications - Soil formation and types – Basic soil properties – Physical properties – Grain size distribution – Consistency and plasticity (Atterberg limits) – Soil classification systems – Permeability of soil – Effective stress and stress distribution in soil – Settlement and consolidation of soil – Shear strength – Compaction of soil – Laboratory tests for determination of soil properties. Applicable code: Egyptian code for soil mechanics and foundations.

References:

1- Soil Mechanics in Engineering Practice, Karl Terzaghi et. al, John Wiley & Sons, 1996
2- Soil Mechanics. R.F. Craig, Springer Science, Third Edition, 1983
3- Principles of Geotechnical Engineering, Braja M. Das, Cengage Learning, Eigth Edition, 2014

CIV313 Steel Structures (1) (2,3,0)

Introduction to steel structures - Steel grades and properties – Design philosophies - Introduction to the Egyptian Code and specifications – Structure systems of industrial and multi-storey buildings - Loads and structural behavior of members – Design of tension members – Design of compression members in trusses – Design of columns subjected to axial load- Design of members subjected to bending moment – Design of beams subjected to bio-axial bending moments - Design of bolted connections subjected to simple shear forces- Welding processes – Design of welded connections subjected to shear force.

References:

1- ANSI/AISC, 360-05, Specifications for Structural Steel Buildings, (ASD/LRFD). Chicago, Illinois, 2016
2- Egyptian Code of Practice for Steel Construction and Bridges, ASD, (Alllowable Stress Design), 2012.
3- Egyptian Code of Practice for Steel Construction (Load and Resistance Factor Design) (LRFD), Ministerial Decree No 359 – 2007, First Edition 2012.
4- Euro Code n.3: Commen Unified Rules for Steel Structuers, EUR 8849 En., 2006
5- Euro Code n.3: Design of Steel Structuers, Part 1- General Rules and Rules for Buildings Vol. 1 and 2, CEC *Industerial Preocesses, Building and Civil Engineereings, 2006
6- Euro Copde n.4-: Commen Rules for Composite Steel and Concrete Structures, EUR 9886 EN., 2006
7- Galambos et al., “Basic Steel Design with LRFD”, ISBN, 0-13-059577-2
8- Loov, R. E., Structural Steel Design: Lecture Notes, 1997, Calgary, Canada. Manual of Steel Construction, Load and Resistance Factor Design, American Institute of Steel Construction (AISC), Thirteenth Edition. 2005
9- Manual of Steel Construction, Load and Resistance Factor Design, American Institute of -Steel Construction (AISC), 2016

CIV314 Hydraulics (2,2,0)

Open Channel flow – Types of flow – channel cross sections – Velocity distribution – Manning and Chezy equations – Canals and drains cross sections design – Critical depth – Non uniform flow – Rapidly varied flow – Hydraulic jump – Flow over weirs – Measurement instruments – Gradually varied flow – Back water curve calculations – Pumps: Efficiency and various types – Turbines: various types.

References:

1- Dawei Han (2008). “Concise Hydraulics”. Ventus Publishing ApS and bookboon.com
2- FLOYD, T.L., Principles of Electrical Circuits, Charles Merrill Publishers, 1990.

CIV315 Transportation and Traffic Engineering (1) (3,3,0)

Introduction: Transport planning definition- Land uses – Levels of planning – Analysis of demand and supply – Data collection: Data collection program – External cordon – Traffic analysis zones – Network representation – Demand pattern data – Sample size – Household surveying – Evaluation of the current situation – Transportation demand forecasting – Sequential approach: Trip generation– Trip distribution: Growth factors methods – GraIVty models – Mode choice – Traffic assignment – Transportation projects evaluation – Introduction to traffic engineering – Traffic engineering element – traffic volume characteristics – Traffic stream characteristics – Travel time characteristics – Speed characteristics – Parking studies – Traffic control systems – Marking – Signs – Signals.

References:

1- CA O'Flaherty, "Transport planning and Traffic engineering", John Wiley & sons, Inc, ISBN: 0 470236191, New York.
2- Denos C. Gazis, "Traffic Theory", Kluwer academic publishers, ISBN: 1-4020-7095-0, New York

CIV316 Highway and Airport Engineering (1) (2,1,1)

Introduction to road design – Geometric design – Structure design – Planning and classifications of roads – Horizontal curves – Super elevation – Vertical alignment – Cross section elements – Cut and fill – Soil classifications – Pavement layers - Structure design of pavements – Design of flexible and rigid pavement– Airport engineering– Airport location selection and its relation to environmental and geographical characteristics– Wind characteristics study– Types of airports- Structure design of airport items – Runways – Taxiways – Airport roads.

References:

1- Nicholas J. Garber, "Traffic and Highway Engineering", Cengage Learning, ISBN-13: 978-0-495-08250-7, Toronto, Canada.
2- American Association of State Highway and Transportation Officials, "AASHTO Manual", 2014, USA.
3- Ministry of Housing, "Egyptian Code of Practice for Urban and Rural Roads", 2008, Egypt.

CIV317 Geotechnical Engineering and Foundations (1) (2,1,2)

Soil failure due to excavation – Lateral earth pressure and its coefficients: at-rest, active, and passive – Lateral earth pressure using Rankin Method: assumptions and limitations – Lateral earth pressure determination using Coulomb method: assumptions and limitations – Lateral earth pressure of braced excavation - Classification of soil retaining systems – Factors affecting the choice of specific soil retaining system – Types of retaining structures - Failure mechanisms of gravity retaining structures – Study and design of gravity retaining structures – Lateral movement of retaining walls – Drainage systems behind retaining walls - Factors affecting bearing capacity of soils – Terzaghi's bearing capacity method – bearing capacity calculations using Egyptian Code of Practice Method – Bearing capacity using field methods – Factors of safety – Types of shallow foundations and factors affecting the choice of specific type of foundation – Design of isolated footing, strip footing, combined footing, and neighbor side footings – Egyptian Code of Practice requirements are followed.

References:

1- Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering. V.N.S. Murthy, CRC Press, 2002
2- Soil Mechanics in Engineering Practice. Karl Terzaghi et. al, John Wiley & Sons, 1996
3- Foundation analysis and design. Joseph E. Bowles, McGraw-Hill, 1988
4- Analysis and Design of Shallow and Deep Foundations - Volume 10, Lemon C. Reese et al., John Wiley & Sons, 2006

CIV318 Reinforced Concrete (3) (2,2,0)

Analysis and design of one way and two way hollow block slabs– Analysis and design of flat slabs using empirical method - Analysis and design of stairs – Analysis and design of slender columns and columns subjected to biaxial moments- Analysis and design of arch slabs and arch girders- Design of frame structures-Design of hinged and fixed supports– Analysis and design of large span structures and roofs for halls - Design is carried out according to the Egyptian code of practice for Reinforced Concrete Structures and Egyptian Code for Loads.

References:

1- ECP 203-2020 Egyptian Code for Design and Construction of Concrete Structures, Ministry of Housing, Utilities and Urban Communities, Giza, Egypt, 2020.
2- Design aids of the Egyptian code for RC structures.
3- الكود المصري لحساب الاحمال والقوي علي المنشاتECP201
4- الكود البريطاني للخرسانة – Concrete Structures BS8110
5- الكود الاوروبي - European code

CIV319 Irrigation and Drainage Engineering (2,2,0)

Definitions - Water resources - Components of irrigation systems - Irrigation water quality - Soil-water plant relationships - Estimation of irrigation water requirements - Irrigation turn rotations - Field and canals water duties - Synoptic diagrams for canals and drains - Studying and design of various types of irrigation systems (Surface -Sprinkler - Drip) - Subsurface drainage - Horizontal and vertical drainage - Concepts of irrigation efficiency and uniformity.

References:

1- G. L. Asawa (2008). "Irrigation and Water Resources Engineering". New Age International (P) Limited, New Delhi.
2- Adrian Laycock (2007). "Irrigation Systems – Design, Planning and Construction". Cromwell Press, UK.

3- N. N. Basak (2007). "Irrigation Engineering". Tenth Reprint, Tata McGraw-Hill Publishing Company Limited, New Delhi.

CIV330 Projects Management (3,3,0)

Introduction about the objectives and systems of the construction industry - Life cycle of construction projects and its characteristics - Project planning - Planning tools – Bar Chart – Network planning techniques- Line of Balance - Critical Path Method- Resources' needs – Resources assignment - Resources smoothing and scheduling (allocation).

References:

1- Erik Larson and Clifford Gray (2018). Project Management: The Managerial Process (7th Edition), ISBN13: 9781259666094, Mc Graw-Hill Education, USA
2- Kumar Neeraj Jha (2011). Construction Project Management: Theory and Practice, Pearson Education India, 2011.

FOURTH YEAR

CIV40 Field Training (2) **(0,0,0)**

Duration of training: four weeks with a total of 160 training hours (8 hours per day x 5 days x 4 weeks). The student performs field training during the summer period outside the faculty in one of the factories, institutions or companies related to the field of specialization (government or private sector), under the supervision of the staff members in the department (one staff member for every five students). At the end of the training period, the student is required to submit a detailed report and the student will be orally examined by the supervisors.

References:

1- Winch GM. Managing construction projects. John Wiley & Sons; 2009 Dec 30.

CIV410 Geotechnical Engineering and Foundations (2) **(2,3,0)**

Support of excavations using sheet piles or diaphragm walls – Types of sheet piles – Design methods according to systems (cantilever, anchored, strutted) - Design of deep foundations (piers, piles, caissons) - Types of piles in relation to design and construction methods – Settlement analysis of deep foundations – Design of pile caps – Design of raft foundations – Design of rafts and foundations as beam on elastic foundations– Design is carried out according to the requirements of the Egyptian code for soil mechanics and foundations and Egyptian code for concrete structures.

References:

1- Pile Foundation Design, Ascalew Abebe & Dr Ian GN Smith, School of the Built Environment, Napier University, Edinburgh
2- Soils and foundations Handbook April 2004
3- State of Florida Department of Geotechnical
4- Terzaghi, Peck and Mesri, "Soil mechanics in engineering practice", John Wiley & Sons, Inc., 1996, ISBN 0471-08658-4
5- Bowles, J. E., "Engineering properties of soils and their measurement", McGraw Hill, 1992, ISBN 0-07-911266-8
6- Egyptian code of practice for soil mechanics and foundation design

Web Sites:

1- Journal of Geotechnical and Environmental Engineering, American Society of Civil Engineers, USA.
2- ASTM Geotechnical Testing Journal, USA.
3- Geotechnical, ICE, UK.
4- Canadian Geotechnical Journal, National Research Council of Canada, Ottawa.

CIV411 Highway and Airport Engineering (2) **(2,2,0)**

Basics of planning airports – Geometrical design for airport features – Structural design for airport features – Roads intersection design –At grade intersection – Grade separated intersections – Application of computer software in roads airport design.

References:

1- Nicholas J. Garber, "Traffic and Highway Engineering", Cengage Learning, ISBN-13: 978-0-495-08250-7, Toronto, Canada.
2- American Association of State Highway and Transportation Officials, "AASHTO Manual", 2014, USA.
3- Ministry of Housing, "Egyptian Code of Practice for Urban and Rural Roads", 2008, Egypt.

CIV412 Design of Irrigation Works (2,3,0)

Design of Crossing Structures (Hydraulic, Structural Calculations, and projections for the Masonry Arch, R.C., Steel Bridges - Hydraulic, Structural Calculations, and projections for each Culverts, Syphons, and Aqueducts) – Weirs (Types – Uses – Forces – Apron design) – Regulators (Uses – Types – Hydraulic and Structural Design – Apron and Gate Design) – Locks (Uses – Types – Elements Design) – Dams (Uses – Classifications – Forces – Required Studies for Erecting Dam – Dam Stability)

References:

1- Sahasrabude SR, Sahasrabude SR. Irrigation engineering and hydraulic structures. Katson Pub.; 1970.
2- Sharma SK. Irrigation Engineering and Hydraulic Structures. S. Chand Publishing; 2017.
3- Novák P, Moffat AI, Nalluri C, Narayanan R. Hydraulic structures. CRC Press; 2007 Jan 24

CIV413 Sanitary Engineering (1) (2,3,0)

Preliminary studies of water supply –Water collection works –Water purification works: Sedimentation – Filtration – Disinfection– Water networks – Wastewater sources and characteristics– Sewerage system and design of sewers – Primary wastewater treatment: Deceleration tank – Screens.

References:

1- Metcalf & Eddy, Wastewater Engineering Treatment and Reuse, 4th edition ISBN 0-07-100824-1. (2004).
2- Water Treatment Plant Design, American Water Works Association, American Society of civil engineers. McGraw-Hill Handbook, Fourth Edition, ISBN 0-07-141872-5. (2005).
3- Water and Wastewater Engineering Design Principles and Practice, Mackenzie L. Davis, McGraw-Hill international Edition. ISBN 978-007-128924-5. (2001).

4- Water Supply and Wastewater Engineering, B S N RAJU, Tata McGraw-Hill Publishing Company Limited, New Delhi. ISBN 0-07-451873-9. (2011).
5- Egyptian Code of Practice for water and wastewater treatment plants design
6- Egyptian Code of Practice for Water networks and sewerage systems

CIV414 Railway Engineering (1) (2,2,0)

Types of locomotives, Tractive effort of locomotives, Train and track resistances, Draw Bar Pull (D.B.P), Maximum Weight of trains and maximum speed, Characteristics of track components and track cross sections, Calculation of stresses in rails – fasteners, Calculation of stresses in ballast layer and sleepers, Design of horizontal curves, Design of super elevation at curved tracks, Design of vertical curves, Design of turnouts and crossings, Problems of embankments, Assessment of thermal effects on CWR, Buckling of tracks.

References:

1. Bernahard Lichtberger, 2011. "Track Compendium". Eurail Press.
2. Lester A. Hoel, Nicholas J. Garber, Adel W. Sadek. (2011). "Transportation Infrastructure Engineering". Cengage Learning.
3. Buddhima Indraratna, "Ballast Railroad Design", 2018, CRC Press.
4. UIC - International union of railways web site. 2021, https://uic.org/

CIV415 Design of Reinforced Concrete Structures (2,2,0)

Design of water tight sections for tanks in water and sewage plants– Analysis and design of tanks– Rectangular tanks whether elevated, ground or underground– Design of deep beams– Structural analysis and design of concrete structures subjected to earthquake loads– Design is carried out according to the Egyptian codes of practice for Reinforced Concrete Structures and Egyptian Code for Loads.

References:

1- Lecture notes and handouts prepared by the staff members
2- ECP 203-2020 Egyptian Code for Design and Construction of Concrete Structures, Ministry of Housing, Utilities and Urban Communities, Giza, Egypt.
3- Egyptian Code of Practice: ECP 201-(2012), "Egyptian Code for Calculating Loads and Forces in Structural Work and Masonry," Ministry of Building Construction, Research Center for Housing, Building and Physical Planning, Cairo, Egypt.
4- Design Aids, Ministry of Housing, Utilities and Urban Communities, Giza, Egypt, 2018.
5- Theory and Design of Reinforced Concrete Tanks by M. HILLAL, 2015.

CIV416 Steel Structures (2) (2,2,0)

Design of bracing systems – Second order analysis – Design of members subjected to axial load, shear force and bending moment – Types of bolts – Design of connections using ordinary, high strength and pretension bolts – Design of bolted and welded eccentric shear loaded connections – Design of connections subjected to tension and shear – Design of connections subjected to bending moment and shear force – Stiffeners – Column base connections –Design of frames and trusses.

References:

1- ANSI/AISC, 360-05, Specifications for Structural Steel Buildings, (ASD/LRFD). Chicago, Illinois, 2016
2- Egyptian Code of Practice for Steel Construction and Bridges, ASD, (Alllowable Stress Design), 2012.
3- Egyptian Code of Practice for Steel Construction (Load and Resistance Factor Design) (LRFD), Ministerial Decree No 359 – 2007, First Edition 2012.
4- Euro Code n.3: Commen Rules for Steel Structuers, EUR 8849 En., 2006
5- Euro Code n.3: Design of Steel Structuers, Part 1- General Rules and Rules for Buildings Vol. 1 and 2, CEC *Industerial Preocesses, Building and Civil Engineereings, 2006
6- Euro Copde n.4-: Commen unified Rules for Composite Steel and Concrete Structures, EUR 9886 EN., 2006
7- Galambos et al., "Basic Steel Design with LRFD", ISBN, 0-13-059577-2
8- Loov, R. E., Structural Steel Design: Lecture Notes, 1997, Calgary, Canada. Manual of Steel Construction, Load and Resistance Factor Design, American Institute of Steel Construction (AISC), Thirteenth Edition. 2005
9- Manual of Steel Construction, Load and Resistance Factor Design, American Institute of -Steel Construction (AISC), 2016

CIV450 Sanitary Engineering (2) (1,2,0)

Primary wastewater treatment: Grit removal chamber– Primary sedimentation tanks – Biological wastewater treatment– Suspended growth reactor (activated sludge process) – Aeration tanks– Attached growth reactor – Trickling filters – Final settling tanks – Contact tanks – Wastewater pump station –Sludge treatment.

References:

1- The Egyptian Code of Practice **(ECP 101-1997**), Part 3 "Wastewater Treatment Plants
2- Metcalf & Eddy, Wastewater Engineering Treatment and Reuse, 4th edition ISBN 0-07-100824-1. (2004)
3- Terence J. McGhee, Water Supply and Sewerage, 6th edition (May 1, 2007), (ISBN 0-07-100873-3)

CIV451 Special Topics in Water and Irrigation Resources (1,2,0)

Dewatering surface water – Sediment transport operations – Coastal and harbor engineering– Lining of canals - Modern irrigation methods - Irrigation structures.

References:

1- David A. Chin (2013). "Water-Resources Engineering". Third Edition, Pearson Education, Inc., New Jersey.

2- Dawei Han (2010). "Concise Hydrology". bookboon.com

CIV452 Highway and Airport Engineering (3) (1,2,0)

Methods of planning roads and airport – Pavement materials – Aggregate – Asphalt pavement – Concrete pavement – Asphalt mix design – Pavement distresses – Road maintenance – Travelers circulation in the airport – Methods of moving travelers – Navigation towers – Connections between towers and planes – Navigation height.

References:

1- Nicholas J. Garber, "Traffic and Highway Engineering", Cengage Learning, ISBN-13: 978-0-495-08250-7, Toronto, Canada.
2- American Association of State Highway and Transportation Officials, "AASHTO Manual", 2014, USA.
3- Ministry of Housing, "Egyptian Code of Practice for Urban and Rural Roads", 2008, Egypt.

CIV453 Railway Engineering (2) (1,2,0)

Types and properties of electric traction, Types of railway tracks, Railway passenger services, Railway freight services, Types of track gauges, Planning of Passenger stations, Passenger terminal stations, planning of freight stations, Freight terminal stations, Horizontal and vertical alignment, planning of railway crossings, Assessment of quantities of track components using computer software, Systems of railway signaling.

References:

1. Bernahard Lichtberger, 2011. "Track Compendium". Eurail Press.
2. Lester A. Hoel, Nicholas J. Garber, Adel W. Sadek. (2011), "Transportation Infrastructure Engineering". Cengage Learning.
3. Buddhima Indraratna, "Ballast Railroad Design", 2018, CRC Press.
4. UIC - International union of railways web site. 2021, https://uic.org/

CIV454 Geotechnical Engineering and Foundations (3) (1,2,0)

Field investigations and tests – Application of field investigations to design – Seepage of water through soil – Flow nets below dams and excavations – Stability of slopes – Swelling problematic soil – Collapsible problematic soil – Design and execution of dewatering systems and ground water control– Analysis and design are carried out according to the Egyptian Code for Soil Mechanics and Foundations.

References:

1- Soil Strength and Slope Stability, Duncan et. al, John Wiley & Sons, 2014
2- Slope Stability Analysis and Stabilization – New Methods and Insight, Cheng and Lau, Taylor and Francis Group, 2008

3- Foundation on Expansive Soils,Fu Chen, Elsevier Science, 2012
4- Construction Dewatering and Groundwater Control, Powers et. al, John Wiley & Sons, 2007

CIV455 Advanced Project Management (2,0,0)

Financial planning – Financial calculations - Cash flow analysis – Financial alternatives – Contract administration – Project cost estimate - Contractors and suppliers management - Quality and productivity control – Monitor and control -Project evaluation (time and cost) - Project time reduction - Time management.

References:

1- Erik Larson and Clifford Gray (2018). Project Management: The Managerial Process (7th Edition), ISBN13: 9781259666094, Mc Graw-Hill Education, USA
2- Kumar Neeraj Jha (2011). Construction Project Management: Theory and Practice, Pearson Education India, 2011.

CIV456 Transportation Planning and Traffic Engineering (2,0,0)

Transportation demand forecasting – Public transportation – Multimodal transportation systems – Highway capacity and classification - Level of service – Traffic impact study – Intersection types– At grade intersections – Grade separation intersections – Intersection evaluation – Signals – Transport planning and traffic engineering software programs.

References:

1- Myer Kutz, "Handbook of transportation engineering", McGraw-Hill (www.digitaengineeringlibrary.com).
2- CA O'Flaherty, "Transport planning and Traffic engineering", John Wiley & sons, Inc, ISBN: 0 470236191, New York.
3- Denos C. Gazis, "Traffic Theory", Kluwer academic publishers, ISBN: 1-4020-7095-0, New York

CIV457 Environmental Engineering (2,0,0)

Introduction to environmental science- Global environment problem- environment management- air pollution- soil pollution- surface water pollution- industrial water pollution-air and water pollution control- hazardous wastes management- solid waste management-environment impact assessment.

References:

1- Lattemann S, Höpner T. Environmental impact and impact assessment of seawater desalination. Desalination. 2008 Mar 1;220(1-3):1-5.

CIV458 Harbor Eng., Shoreline Protection and Internal Navigation (2,0,0)

Natural phenomena: wind, tides, coastal currents, waves– Port Planning: Planning Factors, Breakwaters and Planning– Port Elements Planning: Navigation Canal, Protected Area, Berths, Service Buildings– Design of port elements - Breakwaters: wall piles, concrete balconies, caissons, sidewalks, dry docks and means of ship repair– Navigation: Types of navigation channels, Hydraulic phenomena - The effect of passing boats - The effect of boats in limited water channels - Design and protection of navigation channels.

References:

1- Shore protection manua- Volume I & II - U.S. Army Corps of Engineers
2- Handbook of Coastal and Ocean Engineering - J. Herbich
3- Introduction to coastal and Harbor Engineering - M.M. Abou-Seida - Cairo University
4- هندسة الموانى والمنشات البحرية - د. علاء الدين فطين - هيئة قناة السويس - الاسماعيليه
5- هندسة الموانى والمنشات البحرية - ا.د. ابراهيم عبيدو - هيئة قناة السويس - الاسماعيليه

CIV459 Railway Planning (2,0,0)

Introduction, Thermal effects on railway tracks, Railway track buckling, Design of slab tracks Types and properties of slab tracks, Defects of railway tracks, Types of Railway track inspection and maintenance, Estimation of Maintenance Cost of railway tracks, Platform–train interface for rail passengers – technology review, Track transitions, Sub-ballast and subgrade improvement, Drainage systems of railway tracks, Railway track structural gauges, Modern technologies of Railways.

References

1. Bernahard Lichtberger, 2011. “Track Compendium”. Eurail Press.
2. Lester A. Hoel, Nicholas J. Garber, Adel W. Sadek. (2011), “Transportation Infrastructure Engineering”. Cengage Learning.
3. Buddhima Indraratna, “Ballast Railroad Design”, 2018, CRC Press.
4. UIC - International union of railways web site. 2021, https://uic.org/

CIV490 Graduation Project (0,0,10)

Student is required to perform a project in one of the following fields: Highway and Airport Engineering - Transport and Traffic Engineering - Railway Engineering - Irrigation and Drainage Engineering – Sanitary and Environmental Engineering – Construction Project Management - Geotechnical Engineering and Foundations.

References:

1- Eldosouky, Adel I. (1996). Principles of Construction Project management. Mansoura University Press, Mansoura, Egypt.

2- Gould, Frederick E. (1997). Managing the Construction Process: Estimating, Scheduling, and Project Control.
3- The Egyptian Code of Practice (ECP 101-1997), Part 3 "Wastewater Treatment Plants
4- David A. Chin (2013). “Water-Resources Engineering”. Third Edition, Pearson Education, Inc., New Jersey.
5- Ministry of Housing, “Egyptian Code of Practice for Urban and Rural Roads”, 2008, Egypt.
6- Soil Strength and Slope Stability, Duncan et. al, John Wiley & Sons, 2014
7- Railway Engineering, W Hay, GW& Sons, 1982.
8- CA O’Flaherty, “Transport planning and Traffic engineering”, John Wiley & sons, Inc, ISBN: 0 470236191, New York.

UNIVERSITY REQUIREMENTS

GEN0X0 Technical Language (2,0,0)

Characteristics of the English or French or German technical language, grammar review, effective sentences and their characteristics, identify some common mistakes in the writing of technical sentence, paragraph construction, types of paragraphs, development of communication skills by reading and analysis of excerpts from technical writing in various engineering disciplines such as mechanical, electrical , civil ... etc.

References:

4- Mark Hancock & Annie McDonald, English Result - Intermediate Level, Oxford University press, Last Edition .
5- Durrell, Martin, " Using German : a guide to contemporary usage / Martin Durrell", Cambridge, U.K. ; New York : Cambridge University Press, 2003.
6- Coffman Crocker, Mary E, " Schaum's outline of French grammar", McGraw-Hil, Schaum's outline series, 1999, 4th ed.

GEN011 Computer Skills (1,0,1)

IT concepts and terminology, Computer hardware, operating systems, Computer networks, Internet, Computer graphics, Multimedia systems, Databases. Practical applications: Operating system (Microsoft Windows), Word processing (Microsoft Word), Spreadsheets (Microsoft Excel), Microsoft PowerPoint, Databases (Microsoft Access). Introduction to programming concepts, programming languages and their classification, logical design of programs and algorithms, structural programming and object-oriented programming.

References:

2- Practice using ICDL components

GEN012 History of Engineering & Technology (2,0,0)

The definition of science, technology, engineering and architecture. The development of civilizations and their relationship to human sciences (ancient Egyptian civilization, Roman and Greek civilization, Mesopotamia, dark ages, industrial revolution). Different engineering disciplines and their role in society. The historical relationship between science and technology. The relationship between the development of engineering, the social and economic development of the environment, the challenges of globalization and the new economy. The contribution of engineers in the new millennium, the issues of economic and industrial development in Egypt.

References:

3- James E. McClellan & Harold Dorn, Science and Technology in World History: An Introduction, The Johns Hopkins University Press, 2nd. Ed., 2006.
4- Richard Shelton Kirby, Engineering in History, Dover publications, 1990.

GEN900 Communication & Presentation Skills (1,1,0)

General introduction to communication, the importance of communication, types of communication, communication barriers, listening skills, attributes and methods of reading, verbal communication: speaking and writing skills, non-verbal communication, dialogue skills and strategies of persuasion, communication in the work environment, writing CVs, reports and official letters.

References:

1- Gary Johns and Alan M. Saks, Organizational Behavior, Addison Wesley Longman, 2009.
2- Scgermerhorn, Jr., R. J., Hunt, G. J., and Osborn, N. R., Organizational Behavior, John Wiley & Sons, Inc., New York, 10th. Ed., 2008.

GEN901 Theory of Sustainability (1,1,0)

The course aims to introduce students to the concept of sustainability and its feasibility in order to develop its capabilities to reach architectural applications that contribute to achieving the goals of sustainability and its usefulness and to clarify the risks of unsustainable environment. The course deals with the components of the natural environment and the factors of preserving its components and equilibrium, the biological system, cycles and ecological chains, the presence characteristics of natural resources, energy and biological systems. Rapid development of sustainability applications and their comprehensiveness based on modern means of communication and digital technologies.

References:

1- Perspectives for a New Social Theory of Sustainability, Mariella Nocenzi and Alessandra Sannella, Springer Nature Switzerland 2020 .

GEN902 Human Rights and Combating Corruption (1,1,0)

Human rights: general introduction, definition of human rights, characteristics and principles of human rights, general rules of the idea of human rights, historical development of the idea of human rights, types of human rights, individual rights, collective rights (people's rights), sources of human rights, legal system of rules of protection Human rights, human rights according to the Egyptian constitution in 2014, the duties and obligations of individuals in society. Combating corruption: definition of corruption, its causes, effects and characteristics, types of corruption and its causes, the impact of corruption on human rights and development, the impact of corruption on economic rights and sustainable development, criminal confrontation of corruption.

References:

1- Peter Joseph , The New Human Rights Movement: Reinventing the Economy to End Oppression, Inc. Blackstone Audio: Books, 2017

GEN903 Research and Analysis Skills (1,1,0)

Scientific thinking and its characteristics, definition of scientific research and its characteristics, steps of scientific research (selection of the subject of research, determine the problem of research and selection factors, determine the framework of research, determine the method of research, data analysis), types of scientific studies: exploratory studies, descriptive studies, experimental studies . Methods of scientific research: descriptive approach, social survey, content study, content analysis. Data collection tools: Metrics, observation, interview, questionnaire. Data presentation and analysis methods: Descriptive methods, deductive methods.

References:

1- Gary Johns and Alan M. Saks, Organizational Behavior, Addison Wesley Longman, 2009.
2- Scgermerhorn, Jr., R. J., Hunt, G. J., and Osborn, N. R., Organizational Behavior, John Wiley & Sons, Inc., New York, 10th. Ed., 2008.

GEN904 Entrepreneurship (1,1,0)

Concepts in Entrepreneurship, Entrepreneurship and Small Enterprises, Generating Ideas for Entrepreneurial Projects, University and Entrepreneurship Opportunities and Challenges, Marketing Plan, Operational Plan, Financial Plan, Business Plan Writing, Technological Environment of Entrepreneurship, External Business Environment of Entrepreneurial Projects, Support Programs for Leading Projects Egyptian Economy, Entrepreneurial Project Presentation Skills.

References:

1- Entrepreneurship: An Evidence-Based Guide by Robert A Baron Edward Elgar Pub., 2012.

GEN905 Professional Ethics (1,1,0)

The course provides the background needed to discuss the core topics of engineering ethics, with a focus on the ethical issues facing engineers in the areas of engineering work in companies. The course includes the definition of the general elements of the ethics of the profession and the observance of the public interest and regulations and regulations,

obligations to the community, the responsibilities of engineers, disclosure of violations, behavior, basic principles and codes of the ABET code of conduct of engineers.

References:

1- William Frey, Professinnal Ethics in Engineering, November, 2013, http://cnx.org/content/col10399/1.4/

GEN906 Critical Thinking (1,1,0)

Theoretical concepts (memory, thinking, creativity), an introduction to the thinking skills, the nature of thinking (definition, characteristics, levels), types of thinking (creative, critical, scientific), cognitive thinking skills, meta-cognitive thinking skills, thinking measurement tools, strategies Used in the development of thinking skills, programs to teach thinking skills, methods of teaching thinking skills.

References:

1- Critical Thinking: A Beginner's Guide to Critical Thinking, Better Decision Making and Problem Solving Paperback, by Jennifer Wilson,, Create Space Independent Publishing Platform 2017.

GEN907 Human Resources Management (1,1,0)

Historical development of human resources management, key functions of human resources management, human resources planning, access to human resources, training and development of human resources, compensation of human resources, human resource conservation.

References:

1- Human Resource Management, University of Minnesota Libraries Publishing, 2016

GEN908 Contracts and Legislation (1,1,0)

The course aims to provide the student with the technical and legislative knowledge related to the practice of the profession. The study of building legislation, urban planning and the laws governing the practice of the profession and the work systems (engineer / owner / contractor / ...) at the local and international levels as well as studying the methods of contracting/rules and systems for the preparation of integrated implementation documents. Tenders and methods of their examination and evaluation.

References:

1- Randall S. Schuler, Susan E. Jackson, Strategic Human Resoure Management , Wiley, 2nd ed., 2007.
2- Lewicki, J. R., Saunders, M. D., and Barry, B., Essentials of Negotiation, McGraw - Hill, 5th. Ed., 2011.

GEN909 Method of Scientific Research and Writing (1,1,0)

The course aims to develop the student's abilities to conduct applied scientific research in one of the fields presented for the graduation project and train to work within a research team, while following the steps of sound scientific research to draw conclusions. The elements and components of scientific research: research problem, scientific method to solve problems and fundamental differences between different scientific research methods, methods of collecting data and statistics necessary for research, methods of examination and analysis of data and information and scientific dealing with variables, formulation of research hypotheses, methods of discussion and examination of hypotheses, drawing conclusions. Scientific method of writing a scientific research (thesis writing). The students select one of the problems in the architectural, urban or any technical field, previously presented as the basis for the graduation project, to conduct the necessary scientific research. Finally, the student is discussed orally through a committee to evaluate the student's performance, within his group, and his findings, studies, analyzes, conclusions and recommendations for the graduation project thesis.

References:

1- Research Methodology and Scientific Writing, by C. George Thomas, Ane Books Pvt. Ltd., 2016

CIVIL ENGINEERING STRUCTURES PROGRAM

Program Information

1. **Faculty vision:**

   The faculty of Engineering at Shoubra, Benha University, aspires to be a pioneering college at the national, regional and international levels in the fields of engineering education, scientific research, innovation and entrepreneurship in order to achieve the goals of sustainable development.

2. **Faculty Mission**

   The faculty of Engineering at Shoubra is committed to prepare a graduate with competencies and problem-solving skills that qualify each engineer to compete in local and regional labor markets, the graduate will be able to innovate and become an entrepreneur. The faculty is also committed to the development of engineering sciences and producing internationally distinguished scientific research, within the framework of human values and social responsibility.

3. **Program Vision**

   The Structural Engineering Program aspires to be distinguished locally, regionally and internationally as a pioneering program that provides educational programs, scientific research and community services, and supports innovation and entrepreneurship in the fields of structural engineering to achieve sustainable development goals.

4. **Program Mission**

   The Structural Engineering undergraduate program aims to prepare graduates who can compete in the local and regional markets. The program is committed to provide its students with: quality education, training on scientific research, problem solving, innovation and entrepreneurship skills. The program instills in its graduates the respect for human values and social responsibility.

To judge the compatibility between the program mission and faculty mission, the following matrix is used.

Key Words of Faculty Mission / Key Words of Program Mission	competencies and problem-solving	compete in local and regional labor markets	Innovate and entrepreneur	development of engineering sciences	publication of internationally distinguished scientific research	within the framework of human values and social responsibility
compete in the local and regional markets compete in the local and regional markets		√				
quality education	√			√	√	
training on scientific research				√	√	
problem solving	√					
innovation and entrepreneurship skills			√			
respect for human values and social responsibility						√

5. Program aims

The Civil Engineering -Structures program aims to:

1. To set solid foundations for mastering structural engineering principles through deep understanding of basic sciences and mathematics and to benefit from contemporary technologies and modern applications.
2. To deliver an up-to-date academic curriculum in accordance with international standards in the field of structural engineering taking into account the human values and social responsibility.
3. Providing an educational environment that enables students to achieve their goals in a program that supports their ability to understand and innovate by conducting experiments, analysis and simulations then evaluating them to draw conclusions.
4. Developing effective communication, planning, entrepreneurship, leadership, and teamwork skills efficiently within multidisciplinary and multicultural teams.
5. Providing students with the ability to plan and solve engineering problems according to technical specifications and apply rules of practice, quality standards, health requirements and environmental issues.
6. Preparing graduates to develop their jobs by self-learning and post-graduate studies to actively participate in achieving sustainable economic development and competition locally and regionally

To judge the compatibility of the program mission with its objectives, the following matrix is used:

Key Words of Program Mission / Program Objectives	compete in the local and regional markets	quality education	training on scientific research	problem solving	innovation and entrepreneurship skills	respect for human values and social responsibility
Objective #1		√		√		
Objective #2		√				√
Objective #3				√	√	
Objective #4	√			√	√	
Objective #5				√	√	
Objective #6	√		√			

6. Graduate Attributes

1. Possess strong analytical skills, identify, formulate, and solve complex structural engineering problems by applying engineering fundamentals, basic science and mathematics.
2. Develop and conduct appropriate experimentation on building materials and/or simulation, analyze and interpret data of structural systems, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.
3. Apply structural engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental, ethical and other aspects and within the principles and contexts of sustainable design and development.

4. Utilize contemporary technologies, structural concrete and steel codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.
5. Practice research techniques and methods of investigation as an inherent part of learning.
6. Plan, supervise and monitor implementation of structural engineering projects, taking architectural, electrical, surveying, mechanical, and geotechnical requirements into consideration.
7. Function efficiently as an individual and as a member of multi-disciplinary and multi-cultural teams in international structural engineering firms or structural project consortiums.
8. Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.
9. Having a creative mind to be capable of innovating and improving solutions and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.
10. Acquire and apply new knowledge in structural engineering; and practice self, lifelong and other learning strategies.
11. Take full responsibility for own learning and self-development, engage in lifelong learning and demonstrate ability to engage in post-graduate and research studies

7. Program Competencies

According to the National Academic Reference Standard, the program in Civil Engineering - Structures must satisfy the following Competencies:

1- General Engineering NARS Competencies in 2018		
Level A (NARS)	A.1	Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.
	A.2	Develop and conduct appropriate experimentation and/or simulation, analyze and interpret data, assess and evaluate findings, and use statistical analysis and objective engineering judgment to draw conclusions.
	A.3	Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the discipline, and within the principles and contexts of sustainable design and development.
	A.4	Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.
	A.5	Practice research techniques and methods of investigation as an inherent part of learning.
	A.6	Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.
	A.7	Function efficiently as an individual and as a member of multi-disciplinary and multi- cultural teams.
	A.8	Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.
	A.9	Use creative, innovative and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.
	A.10	Acquire and apply new knowledge; and practice self, lifelong and other learning strategies.
2- Civil NARS Competencies in 2018		
Level B (NARS)	B.1	Select appropriate and sustainable technologies for construction of buildings, infrastructures and water structures; using either numerical techniques or physical measurements and/or testing by applying a full range of civil engineering concepts and techniques of: Structural Analysis and Mechanics, Properties and Strength of Materials, Surveying, Soil Mechanics, Hydrology and Fluid Mechanics.
	B.2	Achieve an optimum design of Reinforced Concrete and Steel Structures, Foundations and Earth Retaining Structures; and at least three of the following civil engineering topics: Transportation and Traffic, Roadways and Airports, Railways, Sanitary Works, Irrigation, Water Resources and Harbors; or any other emerging field relevant to the discipline.
	B.3	Plan and manage construction processes; address construction defects, instability and quality issues; maintain safety measures in construction and materials; and assess environmental impacts of projects.
	B.4	Deal with biddings, contracts and financial issues including project insurance and guarantees.
3- Civil Engineering -Structures ARS		

Level C (ARS)	C.1	Analyze, design, and develop calculation sheets and professional drawings of reinforced concrete and prestressed concrete structural systems including foundations; taking into account soil- structure interaction using computer packages and/or empirical methods which satisfy Egyptian Codes of Practice. In addition, design of thin-walled structures and strengthening of elements.
	C.2	Select suitable building materials for specific applications and environmental conditions based on either laboratory testing or published literature.
	C.3	Identify the different types of structural loads applied to structures and choose suitable statical systems as prerequisites for the structural design. Perform the necessary static and/or dynamic structural analysis under different loading cases. In addition, develop technical reports and calculation sheets for the stresses, deformations and internal forces resisted by the structural elements.
	C.4	Analyze, design and select appropriate gravity and lateral steel structures systems under different loading conditions according to the Egyptian Codes of Practice (ECP, ASD and LRFD). In addition, design of special steel structures, thin-walled constructions, composites, and strengthening of structural elements.

To judge the compatibility of program objectives with its competencies, the following matrix is used:

Program Objectives	Program Competencies																	
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	C1	C2	C3	C4
Objective #1	√							√			√	√	√	√				
Objective #2	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Objective #3	√	√					√	√	√									
Objective #4							√	√	√									
Objective #5	√	√	√	√			√	√	√									
Objective #6			√		√					√								

PROGRAM REQUIREMENTS

B. STUDY REQUIREMENTS FOR CIVIL ENGINEERING PROGRAM (STRUCTURES)

#	Requirements	Contact Hours	%	% according to reference framework
1	Humanities & Social Science	20	8	8-12
2	Mathematics & Basic Sciences	63	25.2	20-26
3	Basic Engineering Science	63	25.2	25-30
4	Applied Engineering and Design	76	30.4	25-30
5	Business Administration	5	2	2-4
6	Engineering Knowledge	13	5.20	3-6
7	Projects & Training	10	4	3-6
		250	100	100

#	Subjects	Contact Hours	%	Min. Percentage according to reference framework (%)
1	University Requirements	20	8	8
2	Faculty Requirements	76	30.8	20
3	Major Specialization Subjects	80	34.4	35
4	Minor Specialization Subjects	74	26.8	Maximum 30
		250	100	

F. LIST OF COURSES
CIVIL ENGINEERING PROGRAM (STRUCTURES)

No.	Code	Course	Contact Hrs				
			Lec.	Tut.	Lab.	Total	
University Requirements (20 Contact Hours)							
1	GEN0x0	Elective - Language requirements List	2	0	0	2	2
2	GEN011	Computer Skills	1	0	1	2	1
3	GEN012	History of Engineering & Technology	2	0	0	2	2
4	GEN9xx	Elective (1) – University list	1	1	0	2	1
5	GEN9xx	Elective (2) – University list	1	1	0	2	1
6	GEN9xx	Elective (3) – University list	1	1	0	2	1
7	GEN9xx	Elective (4) – University list	1	1	0	2	1
8	GEN9xx	Elective (5) – University list	1	1	0	2	1
9	GEN9xx	Elective (6) – University list	1	1	0	2	1
10	GEN9xx	Elective (7) – University list	1	1	0	2	1
Faculty Requirements (70 Contact Hours)							
1	BAS010	Differential Calculus and Algebra	2	2	0	4	3
2	BAS011	Statics	2	1	2	5	3
3	BAS012	Engineering Chemistry	2	1	2	5	3
4	BAS013	Physics of Materials & Electricity	2	1	3	6	3
5	BAS014	Integral Calculus & Analytical Geometry	2	2	0	4	3
6	BAS015	Dynamics	2	1	2	5	3
7	BAS016	Physics of Light, Heat and Magnetism	2	1	2	5	3
8	BAS218	Differential Equations	2	3	0	5	3
9	MEC010	Engineering Drawing (1)	0	3	0	3	1
10	MEC011	Principles of Manufacturing Engineering	1	0	2	3	2
11	MEC012	Engineering Drawing (2)	0	3	1	4	2
12	ARC130	Architectural Construction	1	0	2	3	2
13	CIV112	Geology Science	2	2	0	4	3
14	CIV113	Economics and Statistics	2	2	0	4	3
15	CIV214	Electrical and Mechanical Installations	2	0	0	2	0
16	CIV100	Summer Training	0	0	0	0	0
17	CIV200	Field Training (1)	0	0	0	0	0
18	CIV300	Field Training (2)	0	0	0	0	3
19	CIV491	Graduation Project	0	0	10	10	3
Major Specialization Subjects (86 Contact Hours)							
1	GED130	Surveying (1)	2	0	2	4	3
3	CIV110	Structural Analysis (1)	2	2	0	4	3
4	CIV111	Materials Science	2	2	1	5	3
5	CIV114	Civil Engineering Drawing	1	2	1	4	2
6	CIV115	Structural Analysis (2)	2	2	0	4	3
7	CIV116	Properties of materials	2	0	3	5	3
8	CIV117	Engineering Math Using Computers	1	0	4	5	2
9	CIV210	Structural Analysis (3)	3	3	0	6	4
10	CIV211	Properties of Structural Materials (1)	2	1	2	5	3
11	CIV212	Reinforced Concrete (1)	3	3	0	6	4

12	CIV213	Fluid Mechanics	2	2	0	4	3
13	CIV215	Structural Analysis (4)	2	2	1	5	3
14	CIV216	Properties of Structural Materials (2)	2	0	3	5	3
15	CIV217	Reinforced Concrete (2)	3	3	0	6	4
17	CIV2xx	Computer Elective (1) -List (1)	1	0	1	2	1
18	CIV2xx	Computer Elective (2)-List (2)	1	0	1	2	1
20	CIV324	Geotechnical Engineering	2	0	2	4	3
21	CIV329	Geotechnical Engineering and Foundations (1)	2	0	2	4	3
22	BAS114	Numerical analysis and Operations Research	3	3	0	6	4
Minor Specialization Subjects (74 Contact Hours)							
1	CIV320	Structural Analysis using Computers	2	1	2	5	3
2	CIV321	Reinforced Concrete (3)	2	2	0	4	3
3	CIV322	Steel Structures (1)	2	3	0	5	3
4	CIV323	Roads, transport, and traffic engineering	2	2	1	5	3
4	CIV325	Reinforced Concrete (4)	3	3	0	6	4
5	CIV326	Steel Structures (2)	2	3	0	5	3
6	CIV327	Structural Analysis (5)	2	0	2	4	3
8	CIV331	Water Resources Engineering and Hydraulics	2	2	0	4	3
9	CIV420	Geotechnical Engineering and Foundations (2)	2	0	3	5	3
10	CIV421	Projects Management	2	3	0	5	3
11	CIV422	Steel Structures (3)	2	2	0	4	3
12	CIV423	Reinforced Concrete (5)	2	3	0	5	3
13	CIV424	Sanitary Engineering (1)	2	2	0	4	3
14	CIV4xx	Elective (1) – Civil Engineering (Structures) - List 1	2	2	0	4	3
15	CIV4xx	Elective (2) – Civil Engineering (Structures) - List 1	2	2	0	4	3
16	CIV4xx	Elective (3) – Civil Engineering (Structures) - List 2	1	2	0	3	2
17	CIV4xx	Elective (4) – Civil Engineering (Structures) - List 3	2	0	0	2	2

E. COURSES CLASSIFICATION
CIVIL ENGINEERING PROGRAM (STRUCTURES)

No.	Code	Course	Contact Hrs			
			Lec.	Tut.	Lab.	Total
Humanities & Social Science Subjects (20 Contact Hours)						
1	GEN0x0	Elective - Language requirements List	2	0	0	2
2	GEN011	Computer Skills	1	0	1	2
3	GEN012	History of Engineering & Technology	2	0	0	2
4	GEN9xx	Elective (1) – University list	1	1	0	2
5	GEN9xx	Elective (2) – University list	1	1	0	2
6	GEN9xx	Elective (3) – University list	1	1	0	2
7	GEN9xx	Elective (4) – University list	1	1	0	2
8	GEN9xx	Elective (5) – University list	1	1	0	2
9	GEN9xx	Elective (6) – University list	1	1	0	2
10	GEN9xx	Elective (7) – University list	1	1	0	2
Mathematics & Basic Sciences (63 Contact Hours)						
1	BAS010	Differential Calculus and Algebra	2	2	0	4
2	BAS011	Statics	2	1	2	5
3	BAS012	Engineering Chemistry	2	1	2	5
4	BAS013	Physics of Materials & Electricity	2	1	3	6
5	BAS014	Integral Calculus & Analytical Geometry	2	2	0	4
6	BAS015	Dynamics	2	1	2	5
7	BAS016	Physics of Light, Heat and Magnetism	2	1	2	5
8	BAS114	**Numerical analysis** and Operations Research	3	3	0	6
9	CIV111	Materials Science	2	2	1	5
10	CIV112	Geology Science	2	2	0	4
11	CIV1 13	Economics and Statistics	2	2	0	4
12	CIV117	Engineering Math Using Computers	1	0	4	5
13	BAS218	Differential Equations	2	3	0	5
Business Administration (5 Contact Hours)						
1	CIV421	Projects Management	2	3	0	5
Engineering Knowledge Subjects (13 Contact Hours)						
1	MEC011	Principles of Manufacturing Engineering	1	0	2	3
2	ARC130	Architectural Construction	1	0	2	3
1	MEC010	Engineering Drawing (1)	0	3	0	3
2	MEC012	Engineering Drawing (2)	0	3	1	4
Basic Engineering Science Subjects (63 Contact Hours)						
1	GED130	Surveying (1)	2	0	2	4
2	CIV110	Structural Analysis (1)	2	2	0	4
3	CIV114	Civil Engineering Drawing	1	2	1	4
4	CIV115	Structure Analysis (2)	2	2	0	4
5	CIV11 6	Properties of materials	2	0	3	5
6	CIV210	Structural Analysis (3)	3	3	0	6
7	CIV211	Properties of Structural Materials (1)	2	1	2	5
8	CIV213	Fluid Mechanics	2	2	0	4

9	CIV215	Structural Analysis (4)	2	2	1	5
10	CIV320	Structural Analysis Using Computers	2	1	2	5
11	CIV324	Geotechnical Engineering	2	0	2	4
12	CIV329	Geotechnical Engineering and Foundations (1)	2	0	2	4
13	CIV327	Structural Analysis (5)	2	0	2	4
14	CIV420	Geotechnical Engineering and Foundations (2)	2	3	0	5
Applied Engineering and Design Subjects (76 Contact Hours)						
1	CIV212	Reinforced Concrete (1)	3	3	0	6
2	CIV216	Properties of Structural Materials (2)	2	0	3	5
3	CIV217	Reinforced Concrete (2)	3	3	0	6
4	CIV2xx	Computer Elective (1)- List 1	1	0	1	2
5	CIV2xx	Computer Elective (2)-List 2	1	0	1	2
6	CIV321	Reinforced Concrete (3)	2	2	0	4
7	CIV322	Steel Structures (1)	2	3	0	5
8	CIV323	Roads, transport, and traffic engineering	2	2	1	5
9	CIV325	Reinforced Concrete (4)	3	3	0	6
10	CIV326	Steel Structures (2)	2	3	0	5
11	CIV331	Water Resources Engineering and Hydraulics	2	2	0	4
12	CIV422	Steel Structures (3)	3	2	0	5
13	CIV423	Reinforced Concrete (5)	2	3	0	5
14	CIV424	Sanitary Engineering (1)	2	2	0	4
15	CIV4xx	Elective (1) – Civil Engineering (Structures)- List 1	2	2	0	4
16	CIV4xx	Elective (2) – Civil Engineering (Structures)- List 1	2	2	0	4
17	CIV4xx	Elective (3) – Civil Engineering (Structures)- List 2	1	2	0	3
18	CIV4xx	Elective (4) – Civil Engineering (Structures)- List 3	2	0	0	2
Projects and Field Training Subjects (10 Contact Hours)						
1	CIV100	Summer Training	0	0	0	0
2	CIV200	Field Training (1)	0	0	0	0
3	CIV300	Field Training (2)	0	0	0	0
4	CIV491	Graduation Project	0	0	10	10

STUDY PLAN

STUDY PLAN

PREPARATORY YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
BAS010	Differential Calculus and Algebra	2	2	0	4	60	0	60	120	3
BAS011	Statics	2	1	2	5	45	30	75	150	3
BAS012	Engineering Chemistry	2	1	2	5	45	30	75	150	3
BAS013	Physics of Materials & Electricity	2	1	3	6	45	45	90	180	3
MEC010	Engineering Drawing (1) ×	0	3	0	3	25	20	45	90	3
GEN0x0	Elective - Language requirements List	2	0	0	2	30	0	30	60	2
		10	**8**	**7**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
BAS014	Integral Calculus & Analytical Geometry	2	2	0	4	60	0	60	120	3
BAS015	Dynamics	2	1	2	5	45	30	75	150	3
BAS016	Physics of Light, Heat and Magnetism	2	1	2	5	45	30	75	150	3
MEC011	Principles of Manufacturing Engineering†	1	0	2	3	25	20	45	90	3
MEC012	Engineering Drawing (2) ×	0	3	1	4	30	30	60	120	3
GEN011	Computer Skills ×	1	0	1	2	15	15	30	60	2
GEN012	History of Engineering & Technology	2	0	0	2	30	0	30	60	2
		10	**7**	**8**	**25**				**750**	

× In exercises, students are divided into groups of 15 students each. Two faculty staff members or their assistants will teach each group.

† In workshops, students are divided into groups of 15 students each, and a faculty staff member (or an assistant) as well as a practical trainer will teach each group.

FIRST YEAR (COMMON)
CIVIL ENGINEERING PROGRAM (STRUCTURES)

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
CIV100	Summer Training*	0	0	0	0	-	-	-	-	-
GED130	Surveying (1)	2	0	2	4	30	30	60	120	3
CIV110	Structural Analysis (1)	2	2	0	4	60	0	60	120	3
CIV111	Materials Science	2	2	1	5	45	30	75	150	3
CIV112	Geology Science	2	2	0	4	60	0	60	120	3
CIV113	Economics and Statistics	2	2	0	4	60	0	60	120	3
CIV114	Civil Engineering Drawing*×	1	2	1	4	30	30	60	120	4
		11	**10**	**4**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
GEN9XX	Elective (1) – University list	1	1	0	2	20	10	30	60	2
BAS114	Numerical analysis and Operations Research	3	3	0	6	90	0	90	180	3
ARC130	Architectural Construction	1	2	0	3	45	0	45	90	3
CIV115	Structural Analysis (2)	2	2	0	4	60	0	60	120	3
CIV116	Properties of Materials	2	0	3	5	45	30	75	150	3
CIV117	Engineering Math Using Computers	1	0	4	5	45	30	75	150	3
		10	**8**	**7**	**25**				**750**	

* Prior to registering in the first year, the student should have completed 3 weeks of training in Civil Drawing using Computer (CIV100) for 3 weeks in summer for 5 days per week. The daily training is for 5 hours (2 hrs Lecture + 3 hrs tutorial), amounting to a total of 25 hours per week. A maximum grade of 20 marks is added to the 'semester work' grades of the course Civil Engineering Drawing (CIV114) of the first year.

× The students are divided into groups; two staff members or teaching assistants teach each group of 15 students.

STUDY PLAN (Cont.)

SECOND YEAR (COMMON)
CIVIL ENGINEERING PROGRAM (STRUCTURES)

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
GEN9XX	Elective (2) – University list	1	1	0	2	20	10	30	60	2
CIV210	Structural Analysis (3)	3	3	0	6	45	45	90	180	3
CIV211	Properties of Structural Materials (1)	2	1	2	5	45	30	75	150	3
CIV212	Reinforced Concrete (1)	3	3	0	6	90	0	90	180	4
CIV213	Fluid Mechanics	2	2	0	4	30	30	60	120	3
CIV2xx	Computer Elective (1)- List 1	1	0	1	2	15	15	30	60	3
		13	**9**	**3**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
GEN9XX	Elective (3) – University list	1	1	0	2	20	10	30	60	2
CIV215	Structural Analysis (4)	2	2	1	5	45	30	75	150	3
CIV216	Properties of Structural Materials (2)	2	0	3	5	45	30	75	150	3
CIV217	Reinforced Concrete (2)	3	3	0	6	90	0	90	180	4
CIV218	Differential equations	2	3	0	5	45	30	75	150	3
CIV2xx	Computer Elective (2) - List 2	1	0	1	2	15	15	30	60	3
		12	**8**	**5**	**25**				**750**	

STUDY PLAN (Cont.)

THIRD YEAR
CIVIL ENGINEERING PROGRAM (STRUCTURES)

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
GEN9XX	Elective(4) – University list	1	1	0	2	20	10	30	60	2
CIV300	Field Training (1) *	0	0	0	0	30	30	0	60	-
CIV320	Structural Analysis Using Computers	2	1	2	5	30	30	60	120	3
CIV321	Reinforced Concrete (3)	2	2	0	4	40	20	60	120	3
CIV322	Steel Structures (1)	2	3	0	5	60	0	60	120	3
CIV323	Roads, Transport, And Traffic Engineering	2	2	1	5	45	30	75	150	3
CIV324	Geotechnical Engineering	2	0	2	4	30	30	60	120	3
		12	**8**	**5**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
GEN9XX	Elective (5) – University list	1	1	0	2	20	10	30	60	2
CIV325	Reinforced Concrete (4)	3	3	0	6	90	0	90	180	3
CIV326	Steel Structures (2)	2	3	0	5	75	0	75	150	3
CIV327	Structural Analysis (5)	2	0	2	4	60	0	60	120	3
CIV329	Geotechnical Engineering and Foundations (1)	2	0	2	4	30	30	60	120	3
CIV331	Water Resources Engineering and Hydraulics	2	2	0	4	60	0	60	120	3
		13	**8**	**4**	**25**				**750**	

* After completing the second year, the student undergoes Field Training 1 (CIV300) for 4 weeks during the summer vacation, in a firm or project site in a related field. Every 5 students are supervised by a staff member of the department, (this supervision is not included in the staff member's teaching load).

STUDY PLAN (Cont.)

FOURTH YEAR
CIVIL ENGINEERING PROGRAM (STRUCTURES)

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
GEN9XX	Elective (6) – University list	1	1	0	2	20	10	30	60	2
CIV400	Field Training (2) *	0	0	0	0	15	15	0	30	-
CIV420	Geotechnical Engineering and Foundations (2)	2	3	0	5	30	30	60	120	3
CIV421	Projects Management	2	3	0	5	75	0	75	150	3
CIV422	Steel Structures (3)	2	2	0	4	60	0	60	120	3
CIV423	Reinforced Concrete (5)	2	3	0	5	75	0	75	150	4
CIV424	Sanitary Engineering	2	2	0	4	60	0	60	120	3
		11	**14**	**0**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
GEN9XX	Elective (7) – University list	1	1	0	2	20	10	30	60	2
CIV491	Graduation Project**	0	0	10	10	150	150	0	300	-
CIV4xx	Elective (1) *** Civil Eng. (Structures) - List 1	2	2	0	4	60	0	60	120	3
CIV4xx	Elective (2) Civil Eng. (Structures) - List 1	2	2	0	4	60	0	60	120	3
CIV4xx	Elective (3) Civil Eng. (Structures) - List 2	1	2	0	3	45	0	45	90	3
CIV4xx	Elective (4) Civil Eng. (Structures) - List 3	2	0	0	2	30	0	30	60	2
		9	**6**	**10**	**25**				**750**	

* After completing the third year, the student undergoes Field Training 2 (CIV400) for 4 weeks during the summer vacation, in a firm or project site in a related field. Every 5 students are supervised by a staff member of the department, (this supervision is not included in the staff member's teaching load).
** After completing the second semester, the students are divided into groups and continue performing the graduation project for 4 weeks.
*** Elective (1) is in the same studying field as the graduation project.

LIST OF TECHNICAL LANGUAGES ELECTIVE COURSES

#	Code	Contact Hours	Contact Hrs			
			Lec.	Tut.	Lab.	Total
1	GEN010	English Language	2	0	0	2
2	GEN020	German Language	2	0	0	2
3	GEN020	French Language	2	0	0	2

LIST OF ELECTIVE COURSES FROM UNIVERSITY REQUIREMENTS

#	Code	Contact Hours	Contact Hrs			
			Lec.	Tut.	Lab.	Total
1	GEN900	Communication & Presentation Skills	1	1	0	2
2	GEN901	Theory of Sustainability	1	1	0	2
3	GEN902	Human Rights and Combating Corruption	1	1	0	2
4	GEN903	Research & Analysis Skills	1	1	0	2
5	GEN904	Entrepreneurship	1	1	0	2
6	GEN905	Professional Ethics	1	1	0	2
7	GEN906	Critical Thinking	1	1	0	2
8	GEN907	Human Resources Management	1	1	0	2
9	GEN908	Contracts and Legislation	1	1	0	2
10	GEN909	Method of Scientific Research and Writing	1	1	0	2

LIST OF COMPUTER ELECTIVE COURSES FOR

CIVIL ENGINEERING PROGRAMS (COMMON)

#	Code	Contact Hours	Contact Hrs			
			Lec.	Tut.	Lab.	Total
List (1) of Computer Elective Courses						
1	CIV231	Computer Programing (1)	1	0	1	2
2	CIV232	Computer Aided Drawing (1)	1	0	1	2
List (2) of Computer Elective Courses						
1	CIV233	Computer Programing (2)	1	0	1	2
2	CIV234	Computer Aided Drawing (2)	1	0	1	2

LIST OF ELECTIVE COURSES FOR CIVIL ENGINEERING PROGRAM (STRUCTURES)

#	Code	Contact Hours	Contact Hrs			
			Lec.	Tut.	Lab.	Total
List (1) of Elective Courses						
1	CIV460	Reinforced Concrete Special Structures	2	2	0	4
2	CIV461	Steel Structures (4)	2	2	0	4
3	CIV462	Maintenance, Protection and Strengthening of Structures	2	2	0	4
4	CIV463	Properties of Materials and Quality Control	2	2	0	4
5	CIV464	Advanced Uses of Computers in the Analysis and Design of Structures	2	2	0	4
6	CIV465	Design of Reinforced Wall-Bearing Structures	2	2	0	4
List (2) of Elective Courses						
1	CIV466	Advanced Projects Management	2	1	0	3
2	CIV467	Geotechnical Engineering and Foundations (3)	2	1	0	3
List (3) of Elective Courses						
1	CIV468	Railway Engineering	2	0	0	2
2	CIV469	Reinforced and Prestressed Concrete	2	0	0	2
3	CIV458	Harbor Engineering, offshore Protection and Internal Navigation	2	0	0	2

CIVIL ENGINEERING PROGRAM (STRUCTURES)

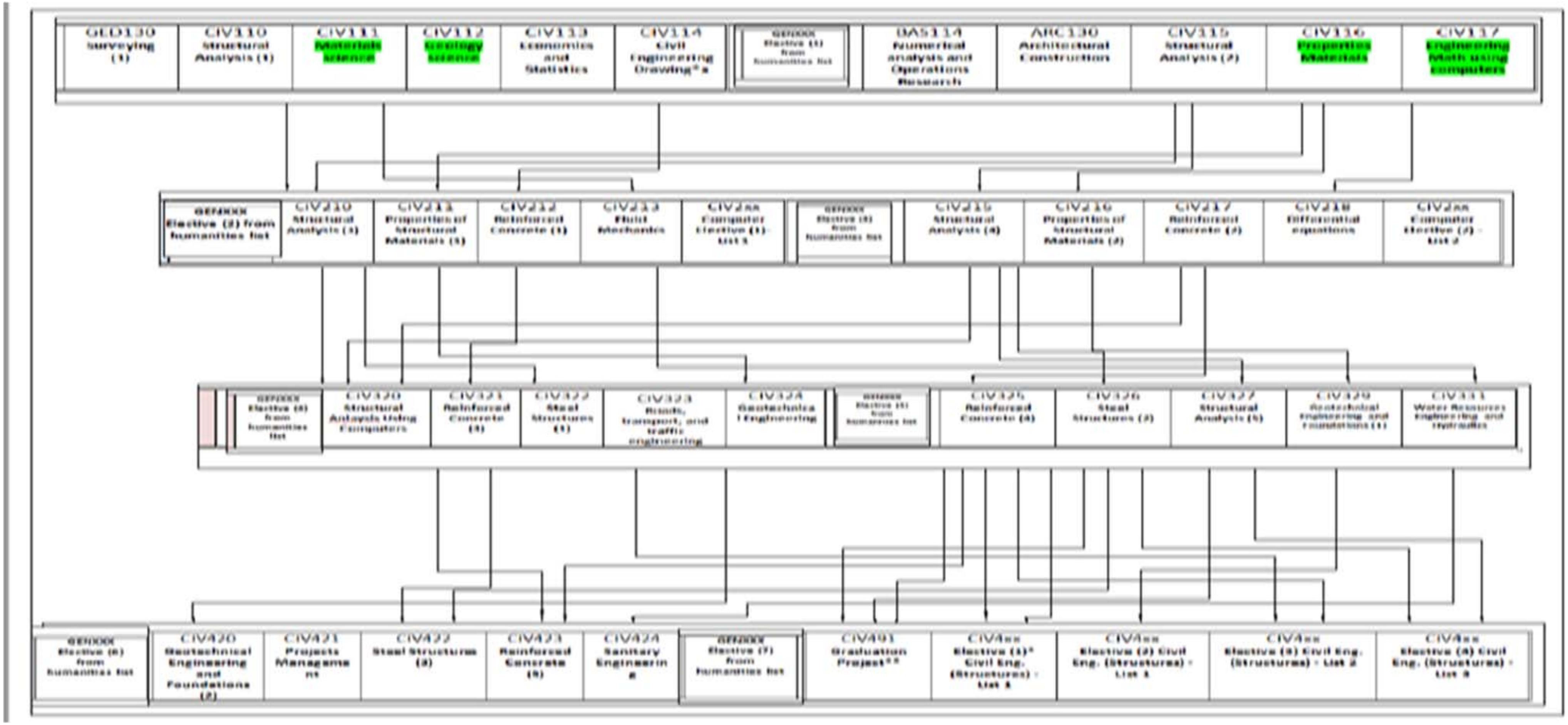
	First Semester						Second Semester						
PREPARATORY YEAR	BAS010 **Differential Calculus and Algebra**	BAS011 **Differential Calculus and Algebra**	BAS012 **Engineering Chemistry**	BAS013 **Physics of Materials & Electricity**	MEC010 **Engineering Drawing (1) ×**	GEN010 **Technical English Language**	BAS014 **Integral Calculus & Analytical Geometry**	BAS015 **Dynamics**	BAS016 **Physics of Light, Heat and Magnetism**	MEC011 **Principles of Manufacturing Engineering †**	MEC012 **Engineering Drawing (2) ×**	GEN011 **Computer Skills ×**	GEN012 **History of Engineering & Technology**
FIRST YEAR	CIV100 Summer Training*	GED130 **Surveying (1)**	CIV110 **Structural Analysis (1)**	CIV111 **Materials science**	CIV112 **Geology science**	CIV113 **Economics and Statistics**	CIV114 **Civil Engineering Drawing*x**	GEN9XX **Elective (1) from university list**	BAS114 **Numerical analysis and Operations Research**	ARC130 **Architectural Construction**	CIV115 **Structural Analysis (2)**	CIV116 **Properties Materials**	CIV117 **Engineering Math using computers**
SECOND YEAR	GEN9XX **Elective (2) from university list**	CIV200 **Field Training (1)***	CIV210 **Structural Analysis (3)**	CIV211 **Properties of Structural Materials (1)**	CIV212 **Reinforced Concrete (1)**	CIV213 **Fluid Mechanics**	CIV2xx **Computer Elective (1)- List 1**	GEN9XX **Elective (3) from university list**	CIV215 **Structural Analysis (4)**	CIV216 **Properties of Structural Materials (2)**	CIV217 **Reinforced Concrete (2)**	CIV218 **Differential equations**	CIV2xx **Computer Elective (2) - List 2**
THIRD YEAR	GEN9XX **Elective (4) from university list**	CIV300 **Field Training (1)**	CIV320 **Structural Analysis Using Computers**	CIV321 **Reinforced Concrete (3)**	CIV322 **Steel Structures (1)**	CIV323 **Roads, transport, and traffic engineering**	CIV324 **Geotechnical Engineering**	GEN9XX **Elective (5) from university list**	CIV325 **Reinforced Concrete (4)**	CIV326 **Steel Structures (2)**	CIV327 **Structural Analysis (5)**	CIV329 **Geotechnical Engineering and Foundations (1)**	CIV331 **Water Resources Engineering and Hydraulics**

FOURTH YEAR	GEN9XX **Elective (6) from university list**	CIV400 **Field Training (2)**	CIV420 **Geotechnical Engineering and Foundations (2)**	CIV421 **Projects Management**	CIV422 **Steel Structures (3)**	CIV423 **Reinforced Concrete (5)**	CIV424 **Sanitary Engineering**	GEN9XX **Elective (7) from university list**	CIV491 **Graduation Project****	CIV4xx **Elective (1)* Civil Eng. (Structures) - List 1**	CIV4xx **Elective (2) Civil Eng. (Structures) - List 1**	CIV4xx **Elective (3) Civil Eng. (Structures) - List 2**	CIV4xx **Elective (4) Civil Eng. (Structures) - List 3**

Elective Courses	CIV231 **Computer Programing (1)**	CIV232 **Computer Aided Drawing (1)**	CIV233 **Computer Programing (2)**	CIV234 **Computer Aided Drawing (2)**

Elective Courses	CIV460 **Reinforced and Prestressed Concrete**	CIV461 **Steel Structures (4)**	CIV462 **Maintenance, Protection and Strengthening of Structures**	CIV463 **Properties of Materials and Quality Control**	CIV464 **Advanced Uses of Computers in the Analysis and Design of Structures**	CIV465 **Design of Reinforced Wall-Bearing Structures**	CIV466 **Advanced Projects Management**	CIV467 **Geotechnical Engineering and Foundations (3)**	CIV468 **Railway Engineering**	CIV469 **Reinforced and Prestressed Concrete**	CIV458 **Harbor Engineering, Shoreline Protection and Internal Navigation**

CIVIL SYSTEMS ENGINEERING PROGRAM TREE



	Code	Course name	Civil-Structure Program Competencies																	
			level A (NARS 2018)										Level C(NARS 2018)				Level C(ARS)			
			A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	C1	C2	C3	C4
PREP. YEAR	BAS010	Differential Calculus and Algebra	√							√										
	BAS011	Statics	√			√				√										
	BAS012	Engineering Chemistry	√	√					√	√										
	BAS013	Physics of Materials & Electricity	√	√					√	√										
	MEC 010	Engineering Drawing (1) ×	√					√		√										
	GEN010	Technical English Language	√	√						√	√									
	BAS014	Integral Calculus & Analytical Geometry	√							√										
	BAS014	Dynamics	√			√	√			√										
	BAS016	Physics of Light, Heat and Magnetism	√	√					√	√										
	MEC 011	Principles of Manufacturing Engineering	√	√				√		√		√								
	MEC 012	Engineering Drawing (2) ×	√			√				√										
	GEN011	Computer Skills ×	√	√						√		√								
	GEN012	History of Engineering & Technology	√		√					√	√									
FIRST YEAR CIVIL	CIV 100	Summer Training					√		√	√		√								
	GED130	Surveying (1)	√										√							
	CIV110	Structural Analysis (1)	√				√						√							
	CIV1	Materials science	√				√						√							

	11																			
	CIV1 12	Geology Science	√	√					√	√										
	CIV1 13	Economics and Statistics	√	√						√	√	√								
	CIV1 14	Civil Engineering Drawing*x	√		√					√			√	√						
	GEN9X X	Communication and Presentation Skills							√	√		√								
	BAS1 14	Numerical Analysis and Operations Research	√	√			√				√	√								
	ARC1 30	Architectural Construction				√			√				√		√					
	CIV1 15	Structural Analysis (2)	√	√			√						√							
	CIV1 16	Properties of Materials	√				√						√							
	CIV1 17	Engineering math using computer	√	√						√		√								
SECOND YEAR CIVIL	GEN9X X	Human Rights and Combating Corruption							√	√		√								
	CIV2 00	Field training (1)				√		√	√	√	√	√			√	√				
	CIV2 10	Structural Analysis (3)	√	√			√						√							
	CIV2 11	Properties of Structural Materials (1)	√	√			√						√							
	CIV2 12	Reinforced Concrete (1)				√								√						
	CIV2 13	Fluid Mechanics	√	√			√						√							
	CIV2 xx	CIV 231 Computer Programing (1)	√							√		√								
		CIV 232 Drawing using computer (1)	√							√		√								
	GEN9X X	Research and Analysis Skills		√			√				√	√								
	CIV2 15	Structural Analysis (4)	√	√			√						√							
	CIV2 16	Properties of Structural Materials (2)	√	√			√						√							
	CIV2 17	Reinforced Concrete (2)	√			√								√						

	BAS 218	Differential equations	√							√										
	CIV2 xx	CIV 233 Computer Programing (2)	√							√		√								
	CIV2 xx	CIV 234 Drawing using computer (2)	√							√		√								
THIRD YEAR CIVIL(Structures)	GEN9X X	Contracts and Legislations			√			√	√	√	√	√				√				
THIRD YEAR CIVIL(Structures)	CIV3 00	Field Training (2) *				√		√	√	√	√	√			√	√				
THIRD YEAR CIVIL(Structures)	CIV3 20	Structural Analysis Using Computers		√									√						√	
THIRD YEAR CIVIL(Structures)	CIV3 21	Reinforced Concrete (3)				√							√				√			
THIRD YEAR CIVIL(Structures)	CIV3 22	Steel Structures (1)				√								√						√
THIRD YEAR CIVIL(Structures)	CIV3 23	Roads, transport, and traffic engineering				√								√						
THIRD YEAR CIVIL(Structures)	CIV3 24	Geotechnical Engineering	√	√		√							√							
THIRD YEAR CIVIL(Structures)	GEN9X X	Professional Ethics			√	√			√	√						√				
THIRD YEAR CIVIL(Structures)	CIV3 25	Reinforced Concrete (4)				√							√				√			
THIRD YEAR CIVIL(Structures)	CIV3 26	Steel Structures (2)				√								√						√
THIRD YEAR CIVIL(Structures)	CIV3 27	Structural Analysis (5)		√									√						√	
THIRD YEAR CIVIL(Structures)	CIV3 29	Geotechnical Eng. and Foundations (1)				√							√	√						
THIRD YEAR CIVIL(Structures)	CIV3 31	Water Resources Engineering and Hydraulics				√							√	√						
FOURTH YEAR CIVIL(Structures)	GEN9X X	Critical Thinking							√	√	√	√								
FOURTH YEAR CIVIL(Structures)	CIV4 20	Geotechnical Eng. and Foundations (2)				√							√	√						
FOURTH YEAR CIVIL(Structures)	CIV4 21	Projects Management			√	√		√	√	√	√	√			√	√				
FOURTH YEAR CIVIL(Structures)	CIV4 22	Steel Structures (3)				√								√						√
FOURTH YEAR CIVIL(Structures)	CIV4 23	Reinforced Concrete (5)				√								√			√			
FOURTH YEAR CIVIL(Structures)	CIV4 24	Sanitary Engineering				√								√						

	GEN9XX	Human Resources Management						√	√	√	√	√			√					
	CIV4xx ELECTIVE (1) list 1	CIV460 (Reinforced Concrete Special Structures)				√								√			√			
		CIV461 Steel Structures (4)				√								√						√
		CIV462 Maintenance, Protection and Strengthening of Structures					√					√			√	√		√		
		CIV463 Properties of Material and Quality control					√					√						√		
		CIV464 Advanced Uses of Computers in the Analysis and Design of Structures	√							√		√							√	
		CIV465 Design of Reinforced Wall-Bearing Structures				√								√			√			
	CIV4xx ELECTIVE (2) list 1	CIV460 (Reinforced Concrete Special Structures)				√								√			√			
		CIV461 Steel Structures (4)				√								√						√
		CIV462 Maintenance, Protection and Strengthening of Structures					√					√			√	√		√		
		CIV463 Properties of Material and Quality control					√					√						√		
		CIV464 Advanced Uses of Computers in the Analysis and Design of Structures	√							√		√							√	
		CIV465 Design of Reinforced Wall-Bearing Structures				√								√			√			
	CIV4xx ELECTIVE (3) list2	CIV 466 Advanced Projects Management			√	√		√	√	√	√	√			√	√				
		CIV467 Geotechnical Eng. and Foundations (3)				√							√	√						
	CIV4xx ELECTIVE (4) list 3	CIV 468 Railway Engineering				√								√						
		CIV469 Reinforced and Prestressed Concrete				√								√			√			
		CIV458 Harbor Engineering, Shoreline Protection and Internal Navigation				√								√						
	CIV491	Graduation Project**				√	√	√	√	√	√	√	√	√			√	√	√	√

Courses Description

PREPARATORY YEAR

BAS010 Differential Calculus and Algebra (2,2,0)

Differentiation: Elementary functions, Polynomials, Exponential, Logarithmic and trigonometric functions, Limits and continuity, Derivative, Implicit differentiation, Maximum and minimum values, Mean value theorem, Taylor's expansion, Integration of Polynomials, Exponential and trigonometric functions, Definite integral.
Algebra: Matrices, Algebra of matrices, Eigenvalues and eigenvectors, Positive and negative matrices, Linear systems, Finite series, Complex numbers, Mathematical induction.
References:
1- Basic Technical Mathematics with Calculus, Kindle Edition, Pearson; 11th Edition, 2017.
2- Textbook of Basic Mathematics: A Beginner's Guide to Geometry, Trigonometry and Calculus, Kindle Edition, 2017.

BAS011 Statics (2,1,2)

Application on space vectors, resultant of a set of forces, moments, equivalent couple moment, equations of equilibrium for rigid body, types of supports, statically determinate beams and trusses, equilibrium under influence of spatial forces and couples, center of mass (for particles and planer surface), moment of inertia (parallel axes, major axes, planer surface).
References:
1- Engineering Mechanics: Statics & Dynamics by Russell Hibbeler, Pearson; 14th Edition, 2015.

BAS012 Engineering Chemistry (2,1,2)

Gaseous state (gases law), chemical equilibrium and Le Chatellier, principle –solutions- phase diagram- basics of water treatment and desalination technology- Introduction on thermo-chemistry and its rules, basics of fuel combustion, calorimetric and determination of heat of combustion –Electrochemistry and conduction in electrolytic solutions. Electrochemical cells and Nernst equation- Corrosion of metals (types, methods of prevention of corrosion – ionic equilibrium and pH calculation- building materials and some petrochemicals industry.
References:
1- Engineering Chemistry: Alpha Science; Illustrated Edition, 2018

BAS013 Physics of Materials & Electricity (2,1,2)

Properties of matter : Physical quantities, standard units and dimensions, atomic structure (electronic distribution, classification of elements and energy levels), crystalline structure (crystalline grid, symmetry, vacuum groups, some simple examples of crystalline structure), stress and strain, mechanical properties of materials (tensile strength and yield stress, etc.,) Physical properties of liquids, viscosity, surface tension, Archimedes principles, Pascal's law, Bernouli's equation and their applications. Laboratory experiments. Electrical: charge and matter, Coulomb's law, electric field, Gauss's law, electric potential, capacitors and dielectric materials, electrical resistance and electromotive force, Ohm's law, simple electrical circuit, laboratory experiments.

References:

1- Modern Classical Physics: Optics, Fluids, Plasmas, Elasticity, Relativity, and Statistical Physics by Kip S. Thorne , Princeton University Press, 2017.
2- Basic Physics: A Self-Teaching Guide by K Kuhn, Noah Books, 2018

MEC010 Engineering Drawing (1) (0,3,0)

This is an introductory course teaches the basics of technical Drawing using manual drafting instruments. The topics include drawing tools, types of lines, sizes and layout of standard drawing sheets, lettering & numbering, scale use, drawing of geometrical figures, dimensioning, axonometric and isometric views, orthogonal and auxiliary projections, drawing of orthographic projection from isometric view.

References:

1- A Textbook of Engineering Drawing: Along with an Introduction to AutoCAD 2015 by Roop Lal, I K International Publishing House, 2015.

GEN0X0 Technical Language (2,0,0)

Characteristics of the English or French or German technical language, grammar review, effective sentences and their characteristics, identify some common mistakes in the writing of technical sentence, paragraph construction, types of paragraphs, development of communication skills by reading and analysis of excerpts from technical writing in various engineering disciplines such as mechanical, electrical, civil ... etc.

References:

1- Mark Hancock & Annie McDonald, English Result - Intermediate Level, Oxford University press, Last Edition.
2- Durrell, Martin, “Using German: a guide to contemporary usage / Martin Durrell”, Cambridge, U.K.; New York: Cambridge University Press, 2003.
3- Coffman Crocker, Mary E, “ Schaum's outline of French grammar”, McGraw-Hil, Schaum's outline series, 1999, 4th ed.

BAS014 Integral Calculus and Analytical Geometry (2,2,0)

Integration: Hyperbolic functions and inverse functions and their derivatives, derivatives of parametric relations, Methods of integrations, integration by partial fractions, parts, reduction and substitution, Applications of definite integrals for obtaining plane area, volumes, arc length and surface area.
Analytical geometry: Cartesian and polar coordinates, Equation of pair of lines, Equation of circle, Conic sections and their properties, Equation of plane, Equations of sphere, cone and cylinder.
References:
1- Basic Technical Mathematics with Calculus, Kindle Edition, Pearson; 11th Edition, 2017.
2- Textbook of Basic Mathematics: A Beginner's Guide To Geometry, Trigonometry and Calculus, Kindle Edition,, 2017.

BAS015 Dynamics (2,1,2)

Kinematics of Particle (rectilinear and curvilinear motion, Cartesian coordinates, projectile motion, natural coordinates, polar coordinates, relative motion), kinetics of Particle (acceleration force method), plane kinematics of rigid bodies (translational and rotational motion, general motion: relative velocities, instantaneous center of zero velocity, planer kinetics of rigid body, acceleration forces, work and energy, impact and momentum.
References:
1- Engineering Mechanics: Statics & Dynamics by Russell Hibbeler, Pearson; 14th Edition, 2015.

BAS016 Physics of Light, Heat and Magnetism (2,1,2)

Principles of heat and thermodynamics: Zero law, first and second Law of thermodynamics, heat transfer, gas theory, temperature measurement methods. Light and laser physics: general concepts of light, straight diffusion of light, Velocity of light diffusion, light beam, optical beams, geometric light, reflection and refraction, wave radiation modeling, wave dissipation, diffraction of light, introduction to lasers, Einstein's equations and magnification Light, Explanation of some lasers (gas, solid and liquid lasers), laser applications. Magnetism: magnetic field, Faraday magnetic law, magnetic induction, Boit-savart's law, Ampere's law, laboratory experiments.
References:
1- Modern Classical Physics: Optics, Fluids, Plasmas, Elasticity, Relativity, and Statistical Physics by Kip S. Thorne , Princeton University Press, 2017.
2- Basic Physics: A Self-Teaching Guide by K Kuhn, Noah Books, 2018

MEC011 Principles of Manufacturing Engineering (1,0,2)

The course introduces the basic concepts of production and productivity. The topics include classification of production processes, industrial safety, engineering materials, ferrous and non-ferrous alloys, steel and its types, cast iron and its types, steel and cast iron production, metal casting processes (sand casting, mold casting, centrifugal casting, wax casting, hot and cold metal forming processes (extrusion, forging, rolling, deep drawing, wire drawing, etc.), metal cutting processes (turning, milling, shaping, drilling, grinding, etc.),metal joining techniques (welding processes, rivets, bolts … etc).Simple workshop measuring tools (Vernier caliper, micrometers, etc.), practical skills in workshops.

References:

1- Workshop Technology (Manufacturing Process) by S. K. Garg, Laxmi Publications; 3rd Revised edition, 2009.

MEC012 Engineering Drawing (2) (0,3,1)

Deduction of the missing orthogonal views, sections in machine members, hatching rules, intersections of solids and surfaces, development of surfaces, drawing of steel structures. Basics of computer aided drafting (CAD) using AutoCAD: Workspace, toolbars, coordinate systems, setting up 2D drawing environment, drawing tools in Auto CAD, object snap, modification tools in AutoCAD, texting and dimensioning in AutoCAD.

References:

1- A Textbook of Engineering Drawing: Along with an Introduction to AutoCAD 2015 by Roop Lal, I K International Publishing House, 2015.

GEN011 Computer Skills (1,0,1)

IT concepts and terminology, Computer hardware, operating systems, Computer networks, Internet, Computer graphics, Multimedia systems, Databases. Practical applications: Operating system (Microsoft Windows), Word processing (Microsoft Word), Spreadsheets (Microsoft Excel), Microsoft PowerPoint, Databases (Microsoft Access). Introduction to programming concepts, programming languages and their classification, logical design of programs and algorithms, structural programming and object-oriented programming.

References:

1- Practice using ICDL components

GEN012 History of Engineering & Technology (2,0,0)

The definition of science, technology, engineering and architecture. The development of civilizations and their relationship to human sciences (ancient Egyptian civilization, Roman and Greek civilization, Mesopotamia, dark ages, industrial revolution). Different engineering disciplines and their role in society. The historical relationship between science and technology. The relationship between the development of engineering, the social and economic development of the environment, the challenges of globalization and the new economy. The contribution of engineers in the new millennium, the issues of economic and industrial development in Egypt.

References:

1- James E. McClellan & Harold Dorn, Science and Technology in World History: An Introduction, The Johns Hopkins University Press, 2nd. Ed., 2006.
2- Richard Shelton Kirby, Engineering in History, Dover publications, 1990.

FIRST YEAR

CIV100 Summer Training (Civil Engineering Drawing)

Training duration: 3 weeks (5 days per week for 5 hours a day) with a total of 75 training hours (5 hours X 15 days), with the following contents: Introduction to civil drawing using AutoCAD program- 2D drawing tools in the program- Training and applications- Training mark will be calculated as (20 marks) and will be added to the semester work marks of Civil Engineering Drawing (CIV 114).

References:

1- G. L. Asawa (2008). “Irrigation and Water Resources Engineering”. New Age International (P) Limited, New Delhi.
2- Adrian Laycock (2007). “Irrigation Systems – Design, Planning and Construction”. Cromwell Press, UK.
3- N. N. Basak (2007). “Irrigation Engineering”. Tenth Reprint, Tata McGraw-Hill Publishing Company Limited, New Delhi.
4- Manual of Steel Construction, Load and Resistance Factor Design, American Institute of -Steel Construction (AISC), 2010

GED130 Surveying (1) (2,0,2)

Definitions - Linear surveying - Normal and grid drawing scale - Compass surveying- Balanchine survey - Surveying devices (Scale - Theodolite - Tachometer) - Methods of determining the level difference – Bench Marks - Leveling errors - Leveling tables - Longitudinal and transverse sections and the shown data – Networks, errors and correction - Design and layout of curves.

References:

1- James M. Anderson and Edward M. Mikhail, 1998: Surveying Theory and Practice.
2- Andrew L. Harbin, 2001: Land Surveyor Reference Manual
3- W. Schofield and M. Breach, 2007: Engineering Surveying
4- S.K. Husain, M.S. Nagaraj, 1992: Textbook of Surveying, fifth revised addition, S.Chand & Company LTD, Ram Nagar, New Delhi-110055

CIV110 Structural Analysis (1) (2,2,0)

Introduction to statics - Types of structures and loads - Types of supports and reactions - Analysis of beams and frames under the effect of concentrated loads - Stability and statical determinacy of structures - Study and analysis of trusses and frames - Normal forces, shear forces and bending moments in beams and frames subjected to concentrated loads.

References:

1- *Course Notes and Solved Examples Prepared by the staff*

2- *El.Dakhakhny, W.M., "Theory of Structures", Part I & II, 9th edition, Dar-Al-Maaref, Cairo, Egypt, 1995, ISBN: 977-02-4790-1*
3- *Beer, F., Johnston, R.E., Dewolf, J.T., and Mazurek D., "Statics and Mechanics of Materials", 3rd edition, Prentice Hall; 896 pages, ISBN 978-0132166744, 2010*

CIV111 Materials Sciences (2,0,3)

Specifications and standard tests – Engineering materials – Microstructure and crystal structure of materials – Mechanical properties of metals and steel reinforcement – Testing of metals and steel reinforcement – Deformation, cracking, toughness and failure of brittle and ductile materials, Strengthening and toughening of materials – Toughness of metals – Timber – Alloys – Fibers – Polymers – Fiber Reinforced Polymers – Types of metal failures – Fatigue, creep and corrosion in metals.

References:

1- Egyptian code, third appendix, Laboratory testing of concrete materials
2- Egyptian code for design and construction of reinforced concrete buildings
3- المواصفات القياسية المصرية م ق م 262-2/2015 "الصلب المستخدم في تسليح الخرسانة" 2015
4- خواص المواد واختباراتها الجزء الأول أ.د/ محمود إمام 2007
5- David Roylance 'MECHANICAL PROPERTIES OF MATERIALS' 2008.
6- American Society for Testing and Materials (ASTM)
7- Ilson, J.M, "Construction Materials, Their nature and behavior", ISBN 0-419-25860
8- Sonayaji, "Civil Engineering Materials", ISBN 0-13-177643-6

Web Sites:

1- https://www3.nd.edu/~amoukasi/CBE30361/Lecture_Mecahnical_Failure_2014.pdf
2- www.uh.edu/~hfang2/MECE3345/Lectures/Chapter8.pdf
3- https://mechanicalc.com/reference/mechanical-properties-of-materials#note-strain-hardening-exponent
4- https://www.tec-science.com/material-science/

CIV112 Geology Science (2,2,0)

Principles of engineering geology – Minerals: physical properties and chemical characteristics – Types of rocks forming Earth's crust – Engineering properties and engineering classification of rocks – Geological processes that affect soil formation – Soil and its physical properties – Groundwater – Internal geological processes affecting Earth's crust morphology (earthquakes and volcanoes) – Geological structures (folds and faults) – Contour and geological maps and associated geological sections.

References:

1- Foundations of Engineering Geology, Tony Waltham, Taylor and Francis Group, 2009
2- Engineering Geology: Principles and Practice, David G. Price, Springer, 2009
3- Engineering Geology, F.G. Bell, Elsevier Science, 2007.
4- Geological Structures and Maps, Richard J. Lisle, Elsevier Science, 2004

CIV113 Economics and Statistics (2,2,0)

The basics of capital management - Accounting methods - Financial disclosures – Assembling and analysis - Accounting forms for construction projects - Companies and projects evaluation - Re-risk relationships – Financial forecasting and analysis- Project financing - Contracts financing and financial options- Descriptive statistics and probabilities - Frequency distributions and hypothesis tests - Logic analysis and relationships.

References:

1- Niall M. Fraser and Elizabeth M. Jewkes (2013), "Engineering Economics: Financial Decision Making for Engineers." Fifth Edition by. Pearson Education Canada, ISBN 978-0-13-237925-0, 2013

CIV114 Civil Engineering Drawing (1,0,3)

Steel structures drawings: Steel sections - Steel elements – Steel connections - Details of beams with steel plates - Foundations - Irrigation structures drawings: Syphons - Arches – Weirs - Culverts- Using computer applications in civil drawing.

References:

1- G. L. Asawa (2008). "Irrigation and Water Resources Engineering". New Age International (P) Limited, New Delhi.
2- Adrian Laycock (2007). "Irrigation Systems – Design, Planning and Construction". Cromwell Press, UK.
3- N. N. Basak (2007). "Irrigation Engineering". Tenth Reprint, Tata McGraw-Hill Publishing Company Limited, New Delhi.

BAS114 Numerical analysis and Operations Research (3,3,0)

Numerical analysis: Numerical methods for solving equations of one variable – Numerical methods for solving linear and nonlinear systems – Numerical integration and differentiation – Curve fitting – Interpolation by finite differences, divided differences and Lagrange's method – Numerical methods for solving ordinary differential equations.

Operations research: Introduction to operations research, Methods of solution – Linear programming problems – Problem formulation – Graphical method – Simplex method – Two phase method – Dual problems.

References:

1) Numerical Analysis, R.L.Burden & J.D. Faires, Brooks/Cole Cengage Learning, U.S.A, 2005.
2) Operations Research, 8th Edition, Hamdy A. Taha, Pearson Prentice Hall, New Jersey, U.S.A, 2007

ARC130 Architectural Construction (1,0,2)

Architectural construction details: Sections - Elevations - Stairs - Insulation and protection layers – Doors and windows - Ceilings - Floors - Paints - Rain drainage - Electrical connections for prefabricated units - Structural systems for buildings with load-bearing walls.
References:

1- Ramsey, Sleeper Architectural Graphic Standards, Wiley, Latest Ed.
2- Mitchell, Building Construction, Batsford, Latest Ed.
3- McKay's, Building Construction, Volume One, Longmans, Latest Ed.

CIV115 Structural Analysis (2) (2,2,0)

Uniformly and non-uniformly distributed loads - Relationship between loads, shear forces and bending moments for beams and frames under the effect of uniformly and non-uniformly distributed loads - Normal stresses and strains due to axial loads - Normal stresses due to bending moments - Normal stresses due to the combination of axial force and bending moment.
References:

1- Course Notes and Solved Examples Prepared by the Instructors
2- El.Dakhakhny, W.M., "Theory of Structures", Part I & II, 9th edition, Dar-Al-Maaref, Cairo, Egypt, 1995, ISBN: 977-02-4790-1
3- Beer, F., Johnston, R.E., Dewolf, J.T., and Mazurek D., "Statics and Mechanics of Materials", 3rd edition, Prentice Hall; 896 pages, ISBN 978-0132166744, 2010

CIV116 Properties of materials (2,0,3)

Cement (Methods of manufacture – Types – Hydration – Properties – Tests) – Natural and artificial aggregates (Types, Properties – Tests) – Chemical and mineral admixtures (Types – Properties – Tests) – Cement replacement materials – Conformance of concrete materials – Properties and testing of fresh concrete.
References:

1- Egyptian code, third appendix, Laboratory testing of concrete materials
2- Egyptian code for design and construction of reinforced concrete buildings

3- 2015 "الصلب المستخدم في تسليح الخرسانة" 2015/2-262 المواصفات القياسية المصرية م ق م
4- 2007 خواص المواد واختباراتها الجزء الأول أ.د/ محمود إمام
5- David Roylance ‘Mechanical Properties Of Materials’ 2008.
6- American Society for Testing and Materials (ASTM)
7- Ilson, J.M, "Construction Materials, Their nature and behavior", ISBN 0-419-25860
8- Sonayaji, "Civil Engineering Materials", ISBN 0-13-177643-6

Web Sites:

1- https://www3.nd.edu/~amoukasi/CBE30361/Lecture_Mecahnical_Failure_2014.pdf
2- www.uh.edu/~hfang2/MECE3345/Lectures/Chapter8.pdf
3- https://mechanicalc.com/reference/mechanical-properties-of-materials#note-strain-hardening-exponent
4- https://www.tec-science.com/material-science/

CIV117 Engineering Math Using Computers (1,0,4)

Computer applications in the fields of: Programming - Databases – Developing documents - Developing engineering diagrams and drawings- Applications in mathematical calculations.

References:

1. Engineering with Excel, Ronald W. Larsen, 4th_Edition, PEARSON.
2. Excel VBA Programming for Dummies, John Walkenbach, 3th_Edition, John Wiley & Sons, Inc.
3. Step-By-Step Optimization with Excel Solver – The Excel Statistical Master, Mark Harmon, Excel Master Series.
4. Data Analysis with Excel, Tutorials Point (I) Pvt. Ltd.

SECOND YEAR

CIV210 Structural Analysis (3) (3,3,0)

Shear stresses in beams - Shear stresses under the effect of twisting moments on circular, non-circular and tubular sections - Shear flow and shear center - Bolted and welded connections - Stresses under combined load conditions – Principal normal and shear stresses and use of Mohr's circle – Deflection of beams using double integration method, singularity function and conjugate beam method - Applications for solving statically indeterminate beams using separation and compositing method.

References:

1- Course Notes and Solved Examples Prepared by the Instructors
2- El.Dakhakhny, W.M., "Theory of Structures", Part I & II, 9th edition, Dar-Al-Maaref, Cairo, Egypt, 1995, ISBN: 977-02-4790-1
3- Beer, F., Johnston, R.E., Dewolf, J.T., and Mazurek D., "Statics and Mechanics of Materials", 3rd edition, Prentice Hall; 896 pages, ISBN 978-0132166744, 2010.
4- Hibbeler, R.C., "Statics and Mechanics of Materials", 3rd edition, Prentice Hall; 896 pages, ISBN 978-0132166744, 2010
5- Hibbeler, R.C., "Structural Analysis", 9th edition, Prentice Hall; 720 pages, ISBN 978-0133942842, 2014
6- McCormac, J.C., "Structural Analysis: Using Classical and Matrix Methods", 4th edition, Wiley, 620 pages; 2012

CIV211 Properties of Structural Materials (1) (2,1,2)

Design of concrete mixes using the British and American methods – Quality control of concrete production on site – Curing of concrete and its effect on properties – Revision on testing of fresh and hardened concrete and factors affecting the results – Non-Destructive tests on structures – Schmidt Hammer test – Ultra Sonic Pulse Velocity test - Core test – Loading test for structural members.

References:

1- American Society for Testing and Materials (ASTM).
2- Aitcin, P.C., High Performance Concrete, Properties and Applications, McGraw Hill, Inc., 1994.
3- Neville, A. M., Properties of Concrete, LONGMAN, England, 1998.
4- ACI, Manual, American Concrete Institute, 1998.
5- Mehta, P.K., Properties of Concrete and Structures, Prentice Hall Inc., New Jersey, 1998.
6- Neville, A., Properties of Concrete, Longman, 1998.

7- ECCS 203-2001 Egyptian Code for Design and Construction of Concrete Structures, Ministry of ousing, Utilities and Urban Communities, Giza, Egypt, 2007.
8- Lecture Notes, Staff of Properties, Testing of Materials and Quality Control Laboratory, 2003.
9- Egyptian Standard Specifications, ESS ,المواصفات القياسية المصرية للمواد, وزارة الصناعة

CIV212 Reinforced Concrete (1) (3,0,3)

Statical systems and load distribution- Cases of loadings- Maximum- maximum internal forces- Ultimate limit state design method- Analysis and design of rectangular, T and L-sections under flexure, shear and torsion- Development and anchorage lengths- Integrated design and reinforcement detailing for simple and continuous beams. Design has to be done according to the Egyptian code for design of reinforced concrete structures.

References:

1- Lecture notes and handouts prepared by the staff.
2- ECP 203-2020 Egyptian Code for Design and Construction of Concrete Structures. Ministry of Housing, Utilities and Urban Communities, Giza, Egypt.
3- Design aids of the Egyptian code for RC structures.
4- Egyptian code for standard reinforcement detailing.
5- Design of concrete structures by A.H. Nilson, 2016.
6- Reinforced concrete: mechanics and design by J.G. MacGregor, 2016.
7- Design of reinforced concrete structures- Vol. 1 and Vol 2 by M. Ghoneim.

CIV213 Fluid Mechanics (2,2,0)

Properties of fluids - Fluid Pressure - Hydrostatic Pressure on Plan Surfaces - Force on Curved Gates, and Buoyancy - Stability of Floating Bodies - Relative Equilibrium of Liquids - Fluid Kinematics - Fluid Dynamics - Momentum Equation and its Applications - Flow in Pipe Lines - Pipes in Series& in Parallel - Dimensional Analysis - Similarity

References:

1- Finnemore, E.J. and Franzini, J.B., 2013. Fluid mechanics with engineering applications tenth edition.
2- T. Al-Shemmeri (2012). “Engineering Fluid Mechanics”. Ventus Publishing ApS and bookboon.com
3- Gerhart, P.M., Gerhart, A.L. and Hochstein, J.I., 2016. Munson, Young and Okiishi's Fundamentals of Fluid Mechanics. John Wiley & Sons.

CIV231 Computer Programing (1) (1,0,1)

Visual Basic: Fundamentals of programming - Input and output - Repetitive and vector operations- Control commands – Parentheses - Partial program - Training in writing engineering programs.

References:

1- *Autodesk Official Training Guide, Learning AutoCAD 2019/2020*

CIV232 Computer Aided Drawing (1) (1,0,1)

AutoCAD: Drawing commands - Modification (editing) and questioning commands - Display control - Layers and line types - Drawing aids - Grouped units - Dimensions and hatching - Printing- Working in networks.

References:

1- *Autodesk Official Training Guide, Learning AutoCAD 2019/2020*

CIV215 Structural Analysis (4) (2,2,1)

Deformations for statically determinate structures using the method of virtual work - Statically indeterminate structures - Analysis of statically indeterminate structures using the method of Virtual work- Three-moment equation method- Buckling of columns– Influence lines for statically determinate structures.

References:

1- *Course Notes and Solved Examples Prepared by the staff*
2- *El.Dakhakhny, W.M., "Theory of Structures", Part I & II, 9th edition, Dar-Al-Maaref, Cairo, Egypt, 1995, ISBN: 977-02-4790-1*
3- *Beer, F., Johnston, R.E., Dewolf, J.T., and Mazurek D., "Statics and Mechanics of Materials", 3rd edition, Prentice Hall; 896 pages, ISBN 978-0132166744, 2010.*
4- *Hibbeler, R.C., "Statics and Mechanics of Materials", 3rd edition, Prentice Hall; 896 pages, ISBN 978-0132166744, 2010*
5- *Hibbeler, R.C., "Structural Analysis", 9th edition, Prentice Hall; 720 pages, ISBN 978-0133942842, 2014*
6- *McCormac, J.C., "Structural Analysis: Using Classical and Matrix Methods", 4th edition, Wiley, 620 pages; 2012*

CIV216 Properties of Structural Materials (2) (2,0,3)

Microstructure of hardened concrete (phases and types of pores) and their effect on properties – Factors affecting permeability of hardened concrete - Measurement methods and how to improve permeability – Durability – Mechanisms of deterioration of hardened concrete in different service conditions and methods of protection - Reasons and factors affecting the volume changes in hardened concrete (elastic deformation – Deformation due to temperature changes – Shrinkage – Creep) and the effect of these changes on structures and their measurement methods.

References:

1- *American Society for Testing and Materials (ASTM).*
2- *Aitcin, P.C., High Performance Concrete, Properties and Applications, McGraw Hill, Inc., 1994.*
3- *Neville, A. M., Properties of Concrete, LONGMAN, England, 1998.*
4- *ACI, Manual, American Concrete Institute, 1998.*
5- *Mehta, P.K., Properties of Concrete and Structures, Prentice Hall Inc., New Jersey, 1998.*
6- *Neville, A., Properties of Concrete, Longman, 1998.*
7- *ECCS 203-2001 Egyptian Code for Design and Construction of Concrete Structures, Ministry of ousing, Utilities and Urban Communities, Giza, Egypt, 2007.*
8- *Lecture Notes, Staff of Properties, Testing of Materials and Quality Control Laboratory, 2003.*
9- *Egyptian Standard Specifications, ESS, المواصفات القياسية المصرية للمواد, وزارة الصناعة, أخر إصدار*

CIV217 Reinforced Concrete (2) (3,0,3)

Design issues for shear fraction, punching shear, corbels and bearing strength -Design of short columns under axial and eccentric loads- Analysis and design of one way and two-way solid slabs under all types of loads- Design of paneled beams system- Serviceability limit states for deflection of beams. Design has to be done according to the Egyptian code for design of reinforced concrete structures.

References:

1- Lecture notes and handouts prepared by the staff.
2- ECP 203-2020 Egyptian Code for Design and Construction of Concrete Structures. Ministry of Housing, Utilities and Urban Communities, Giza, Egypt.
3- Design aids of the Egyptian code for RC structures.
4- Egyptian code for standard reinforcement detailing.
5- Design of concrete structures by A.H. Nilson, 2016.
6- Reinforced concrete: mechanics and design by J.G. MacGregor, 2016.
7- Design of reinforced concrete structures- Vol. 1 and Vol 2 by M. Ghoneim.

CIV218 Differential Equations (2,3,0)

Multi variable functions- partial differentiation – maximum and minimum values – boundaries – curvature – multiple differentiation – ordinary differential Equations from first-degree and higher degrees – vector analysis.

References:

1- Differential Equations and Linear Algebra (Gilbert Strang), Wellesley-Cambridge; UK ed. Edition,2014.
2- Elementary Differential Equations and Boundary Value Problems by William E. Boyce et al., Wiley; 11th Edition, 2017.

CIV233 Computer Programing (2) (1,0,1)

Programming applications for network design, transportation, and geotechnical engineering.

References:

1- *Autodesk Official Training Guide, Learning AutoCAD 2019/2020*

CIV234 Computer Aided Drawing (2) (1,0,1)

REVIT: Drawing - Modification and questioning commands - Display control - Layers and line types - Drawing aids - Linking with structural analysis software.

References:

1- *Autodesk RIVIT 2010, 2009.*

THIRD YEAR

CIV300 Field Training (1) (0,0,0)

Duration of training: four weeks with a total of 160 training hours (8 hours per day x 5 days x 4 weeks. The student performs field training during the summer period outside the faculty in one of the factories, institutions or companies related to the field of specialization (governmental or private sector); under the supervision of the staff members in the department (one staff member for every five students). At the end of the training period, the student is required to submit a detailed report and is orally examined by the supervisors.

References:

1- Kumar Neeraj Jha (2011). Construction Project Management: Theory and Practice, Pearson Education India, 2011.

CIV320 Structural Analysis Using Computers (2,1,2)

Revision of programming basics - Structural analysis using computer applications - For plane and space trusses, plane frames and paneled beams using stiffness method – Moment distribution method- Stability and equilibrium of plane trusses and frames.

References:

1- Dawe, D.J., “Matrix and Finite Element Displacement Analysis of Structures”, Clarendon Press, 1984, ISBN: 0-19-856211-X
2- McGuire, W. and Gallagher, R.H., “Matrix Structural Analysis”, John Wiley & Sons, 1986, ISBN: 0-471-03059-7
3- Shaker, A. “Plane Analysis of Indeterminate Structures”, Ain Shams University Press, 1976
4- Nour, M. A., “Matrix Structural Analysis”, Dar El Maarefah, 2008, ISBN: 977-5423-66-X
5- Meyers, V.J., “Matrix Analysis of Structures”, Harper & Row, 1983, ISBN: 0-06-04438-X
6- Wang, C.K., “Intermediate Structural Analysis”, McGraw Hill, 1983, ISBN: 0-07-068135-X
7- Prezemieniecki, J.S., “Theory of Matrix Structural Analysis”, Dover Pub.,1985, ISBN 0-486-64948-2
8- Sennett, R.E., “Matrix Analysis of Structures”, Waveland Press, Inc., 2000, ISBN: 978-1-57766-143-6

CIV321 Reinforced Concrete (3) (2,2,0)

Analysis and design of one way and two-way hollow block slabs– Analysis and design of flat slabs using the empirical method and the equivalent frame method– Design of stairs- Design of slender columns subjected to eccentric loads– Analysis and design of slender columns subjected to biaxial moments– Design of arch slabs and arch girders– Design is carried out according to the Egyptian code of practice for Reinforced Concrete Structures and Egyptian Code for Loads.

References:

1- IBC, Manual, International Building Code,2009 2009
2- ACI, Manual, American Concrete Institute, 2019
3- Park and Paulay, Design of Reinforced Concrete Elements, J. W. and Sons,1985
4- ECCS 203-2020 Egyptian Code for Design and Construction of Concrete Structures, Ministry of Housing, Utilities and Urban Communities, Giza, Egypt, 2020.

CIV322 Steel Structures (1) (2,3,0)

Introduction to design of steel structures - Loads and structural systems and their resistance to horizontal forces - Preparation of general site drawings for metal structures - Design of welded and bolted connections - Design of tension members - Buckling analysis of compression members - Design of compression members and columns - Design of beams - design of purlins as cold-formed steel elements- Design of composite elements

References:

1- ANSI/AISC, 360-05, Specifications for Structural Steel Buildings, (ASD/LRFD). Chicago, Illinois, 2012
2- Egyptian Code of Practice for Steel Construction and Bridges, ASD, (Alllowable Stress Design), 2012.
3- Egyptian Code of Practice for Steel Construction (Load and Resistance Factor Design) (LRFD), Ministerial Decree No 359 – 2007, First Edition 2012.
4- Euro Copde n.3-88: Commen Unified Rules for Steel Structuers, EUR 8849 En., 2001
5- Euro Copde n.3-89: Design of Steel Structuers, Part 1- General Rules and Rules for Buildings Vol. 1 and 2, CEC *Industerial Preocesses, Building and Civil Engineereings, 2001
6- Euro Copde n.4-85: Rules for Composite Steel and Concrete Structures, EUR 9886 EN., 2001
7- Loov, R. E., Structural Steel Design: Lecture Notes, 1997, Calgary, Canada. Manual of Steel Construction, Load and Resistance Factor Design, American Institute of Steel Construction (AISC), Thirteenth Edition. 2005
8- Mc Cormac, "Structural steel Design", 4th Edition, ISBN – 0-06-500060-9
9- Segui, W. T., LRFD Steel Design, Fourth Edition, 2007, Thompson, Brooks/Cole, USA.
10- Manual of Steel Construction, Load and Resistance Factor Design, American Institute of -Steel Construction (AISC), 2010

CIV323 Road, Transport, And Traffic Engineering (2,2,1)

Introduction: Transport planning definition- Land uses – Levels of planning – Analysis of demand and supply – Data collection: Data collection program – External cordon – Traffic analysis zones – Network representation – Demand pattern data – Sample size – Household surveying – Evaluation of the current situation – Transportation demand forecasting – Sequential approach: Trip generation– Trip distribution: Growth factors methods – Gravity models – Mode choice – Traffic assignment – Transportation projects evaluation – Introduction to traffic engineering – Traffic engineering element – traffic volume characteristics – Traffic stream characteristics – Travel time characteristics – Speed characteristics – Parking studies – Traffic control systems

Introduction to road design – Geometric design – Structure design – Planning and classifications of roads – Horizontal curves – Super elevation – Vertical alignment – Cross section elements –Pavement layers – Structure design of pavements – Design of flexible and rigid pavement– Airport engineering – Airport location selection and its relation to environmental and geographical characteristics

References:

1- Nicholas J. Garber, "Traffic and Highway Engineering", Cengage Learning, ISBN-13: 978-0-495-08250-7, Toronto, Canada.
2- American Association of State Highway and Transportation Officials, "AASHTO Manual", 2014, USA.
3- Ministry of Housing, "Egyptian Code of Practice for Urban and Rural Roads", 2008, Egypt.
4- CA O'Flaherty, "Transport planning and Traffic engineering", John Wiley & sons, Inc, ISBN: 0 470236191, New York.
5- Denos C. Gazis, "Traffic Theory", Kluwer academic publishers, ISBN: 1-4020-7095-0, New York

CIV324 Geotechnical Engineering (2,0,2)

Introduction to geotechnical engineering and its applications - Soil formation and types – Basic soil properties – Physical properties – Grain size distribution – Consistency and plasticity (Atterberg limits) – Soil classification systems – Permeability of soil – Effective stress and stress distribution in soil – Settlement and consolidation of soil – Shear strength – Compaction of soil – Laboratory tests for determination of soil properties. Applicable code: Egyptian code for soil mechanics and foundations.

References:

1- Soil Mechanics in Engineering Practice, Karl Terzaghi et. al, John Wiley & Sons, 1996
2- Soil Mechanics. R.F. Craig, Springer Science, Third Edition, 1983
3- Principles of Geotechnical Engineering, Braja M. Das, Cengage Learning, Eigth Edition, 2014

CIV325 Reinforced Concrete (4) (3,3,0)

Design of statically determinate and statically indeterminate frames under vertical and lateral loads–Design of Vierendeel girders- Analysis and design of saw tooth structures (slab and girder types) –Design of hinged and fixed supports– Analysis and design of large span structures and roofs for halls and industrial buildings– The analysis, design and detailing are performed according to the requirements of the Egyptian Code of practice for Reinforced Concrete Structures.

References:

1- ECP 203-2020 Egyptian Code for Design and Construction of Concrete Structures, Ministry of Housing, Utilities and Urban Communities, Giza, Egypt.
2- Design aids of the Egyptian code for RC structures.
3- الكود المصري لحساب الاحمال والقوي علي المنشات ECP201
4- – الكود البريطاني للخرسانة Concrete Structures BS8110
5- - الكود الاوروبيEuropean code

CIV326 Steel Structures (2) (2,3,0)

Introduction to the design of steel Frames – Buckling of eccentrically loaded members - Design of eccentrically loaded columns – Lateral torsional buckling of beams - Design of flexural members (beams) – Interactive buckling of beam-columns - Design of members under axial load and bending moment (Beam-column Frame Members) – Design of welded rigid connections – Design of bolted rigid connections using bearing type bolts – Design of rigid connections using friction type bolts – Design of extended end plate connections – Design of hinged column bases – Design of fixed column bases – Wind load calculations - Design of wind bracing systems – Structural detailing of steel structures.

References:

1- Egyptian Code of Practice for Steel Construction and Bridges, ASD, (Alllowable Stress Design), 2012.
2- Egyptian Code of Practice for Steel Construction (Load and Resistance Factor Design) (LRFD), Ministerial Decree No 359 – 2007, First Edition 2012.
3- ANSI/AISC, 360-16, Specifications for Structural Steel Buildings, (ASD/LRFD). American Inisitute of Steel Construction, Chicago, Illinois, 2016
4- CEN European Committee forstandarization,EN 1993: 2006, Euro Code 3: Design of Steel Structures, part 1.1 to part 1.12, CEN, Brussels, Belgium, 2006.
5- Patrick J. Dowling, Peter R. Knowles, Graham W. Owens, “Strutural Steel Design” ISBN-10: 0408037059, Publisher; Butterworth-Heinemann, December 1988.
6- Machally, E. B., “Behavior, analysis and design of structural steel elements (volume I to V)” ISBN 977-19-6629-4
7- Gaylor and Graylor, “Steel Structures”. ISBN 0-07-112623-3-6
8- Charles G. Salmon, John E. Johnson, "Steel Structures: Design and Behavior", Edition 5, ISBN-13: 9780131885561, October 2008
9- McCormac, “Structural steel Design”, 4th Edition, ISBN – 0-06-500060-9

CIV327 Structural Analysis (5) (2,0,2)

Evaluation of dead and live loads, wind loads, earthquakes and bridge loads according to the Egyptian Code of Practice for loads - Analysis of structures by the Plasticity method - Basics of dynamics of structures: representing structures as one-degree-of-freedom systems - Solutions of one-degree-of-freedom systems - Solutions of multi-degree-of-freedom systems - Applications.

References:

1. Course Notes and Solved Examples Prepared by the Instructors
2. Egyptian Code for Loads Calculation ***ECP201***, 2012.
3. Minimum Design Loads for Buildings and Other Structures, ***ASCE7-10***, ISBN: 978-0-7844-1115-5
4. International Building Code, ***IBC 2009***, ISBN: 978-1-58001-725-1.
5. Williams, A., "***Structural Analysis: In Theory and Practice***", Butterworth-Heinemann Publications, 2009, ISBN: 978-1-85617-550-0
6. Clough, R.W and Penzien, J. "***Dynamics of Structures***", 3rd Edition, Computers & Structures, INC., 2003
7. Paz, M. and Leigh, W., "***Structural Dynamics: Theory and Computation***", 5th Edition, Kluwer Academic Publishers, 2004, ISBN: 1-4020-7667-3
8. Chopra, A.K., "***Dynamics of Structures: Theory and Applications to Earthquake Engineering"***, Prentice-Hall, Inc., 1995, ISBN: 0-13-855214-2

CIV329 Geotechnical Engineering and Foundations (1) (2,0,2)

Soil failure due to excavation – Lateral earth pressure and its coefficients: at-rest, active, and passive – Lateral earth pressure using Rankin Method: assumptions and limitations – Lateral earth pressure determination using Coulomb method: assumptions and limitations – Lateral earth pressure of braced excavation - Classification of soil retaining systems – Factors affecting the choice of specific soil retaining system – Types of retaining structures - Failure mechanisms of gravity retaining structures – Study and design of gravity retaining structures – Lateral movement of retaining walls – Drainage systems behind retaining walls - Factors affecting bearing capacity of soils – Terzaghi's bearing capacity method – bearing capacity calculations using Egyptian Code of Practice Method – Bearing capacity using field methods – Factors of safety – Types of shallow foundations and factors affecting the choice of specific type of foundation – Design of isolated footing, strip footing, combined footing, and neighbor side footings – Egyptian Code of Practice requirements are followed.

References:

1- Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering. V.N.S. Murthy, CRC Press, 2002
2- Soil Mechanics in Engineering Practice. Karl Terzaghi et. al, John Wiley & Sons, 1996

3- Foundation analysis and design. Joseph E. Bowles, McGraw-Hill, 1988
4- Analysis and Design of Shallow and Deep Foundations - Volume 10, Lemon C. Reese et al., John Wiley & Sons, 2006

CIV331 Water Resources and Hydraulics (2,2,0)

Open Channels Uniform Flow (Best Hydraulic cross Section and Wide Section Design) – Specific Energy and Critical Depth – Open Channel Non-Uniform Flow (Hydraulic Jump – Gradually Varied Flow) – Sprinkler and Dripper Irrigation Systems- Irrigation Structures (Hydraulic, Structure Design for Culvert and its projections)

References:

1- *The Complete Irrigation Workbook: Design, Installation, Maintenance & Water Management by Larry Keesen and Cindy Code (May 1, 1995)*
2- *Irrigation and drainage, Faculty of Engineering, Mansoura University, SharleSekla, 2003*
3- *Irrigation and drainage networks - Planning and Engineering Design, Faculty of Engineering, Alexandria University, 2000*
4- *Irrigation and Drainage Engineering, Faculty of Engineering, Ain Shams University 2001*

FOURTH YEAR

CIV400 Field Training (2) (0,0,0)

Duration of training: four weeks with a total of 160 training hours (8 hours per day x 5 days x 4 weeks). The student performs field training during the summer period outside the faculty in one of the factories, institutions or companies related to the field of specialization (government or private sector), under the supervision of the staff members in the department (one staff member for every five students). At the end of the training period, the student is required to submit a detailed report and the student will be orally examined by the supervisors.

References:

1- Winch GM. Managing construction projects. John Wiley & Sons; 2009 Dec 30.

CIV420 Geotechnical Engineering and Foundations (2) (2,3,0)

Support of excavations using sheet piles or diaphragm walls – Types of sheet piles – Design methods according to system (cantilever, anchored, strutted) - Design of Deep Foundations (piers, piles, caissons)- Types of piles in relation to design and construction methods – Settlement analysis of deep foundations – Design of pile caps– Design is carried out according to requirements of the Egyptian Code for Soil Mechanics and Foundations and Egyptian Code for Concrete Structures.

References:

1- Pile Foundation Design, Ascalew Abebe & Dr Ian GN Smith, School of the Built Environment, Napier University, Edinburgh,
2- Soils and foundations Handbook, 2004
3- State of Florida Department of Geotechnical
4- Terzaghi, Peck and Mesri, "Soil mechanics in engineering practice", John Wiley & Sons, Inc., 1996, ISBN 0471-08658-4
5- Bowles, J. E., "Engineering properties of soils and their measurement", McGraw Hill, 1992, ISBN 0-07-911266-8
6- Egyptian code of practice for soil mechanics and foundation design

Web Sources:

1- Journal of Geotechnical and Environmental Engineering, American Society of Civil Engineers, USA.
2- ASTM Geotechnical Testing Journal, USA.
3- Geotechnical, ICE, UK.
4- Canadian Geotechnical Journal, National Research Council of Canada, Ottawa.
5- WWW.ASCE.Org

CIV421 Projects Management (2,3,0)

Support of excavations using sheet piles or diaphragm walls – Types of sheet piles – Design methods according to system (cantilever, anchored, strutted) - Design of Deep Foundations (piers, piles, caissons)- Types of piles in relation to design and construction methods – Settlement analysis of deep foundations – Design of pile caps– Design is carried out according to requirements of the Egyptian Code for Soil Mechanics and Foundations and Egyptian Code for Concrete Structures.

References:

1- Erik Larson and Clifford Gray (2018). Project Management: The Managerial Process (7th Edition), ISBN13: 9781259666094, Mc Graw-Hill Education, USA
2- Kumar Neeraj Jha (2011). Construction Project Management: Theory and Practice, Pearson Education India, 2011.

CIV422 Steel Structures (3) (2,2,0)

Introduction to steel bridges– Structural systems of steel bridges– Loads on roadway steel bridges– Design of steel bridges against fatigue– Structural design of Floor Beams– Structural design of floor deck– Structural design of welded plate girders– Design of different types of web stiffeners– Design of welded and bolted Splices– Design of wind Bracing Systems – Design of bridge supports – Detailed drawings.

References:

1- Egyptian Code of Practice for Steel Construction and Bridges, ASD, (Alllowable Stress Design), 2012.
2- Manfred Hirt, Jean-Paul Lebet “Conceptual and Structural Design of Steel and Steel-Concrete Composite Bridges”, First Edition, ISBN-10 : 9781466572966, Publisher; EPFL Press; 1st edition, June 2013.
3- U. S. Department of Transportation Federal Highway Administration “Steel Bridge Design Handbook” Publication No. FHWA-HIF-16-002 - Vol. 4, December 2015.
4- Sukhen Chatterjee, “The Design of Modern Steel Bridges”, Second Edition, print ISBN:9780632055111, Online ISBN:9780470774373, Wily Digital Archive, January, 2003.
5- Utpal K. Ghosh “Design and Construction of Steel Bridges”, SBN 9780415418362, Publishe; CRC Press; September 21, 2006 .
6- Machally E.B., “Structural systems for wind and earthquake loads”, (volume II)”, ISBN 977-19-6629-4.
7- Design of Bridges, Metwally Abo Hamad.
8-

CIV423 Reinforced Concrete (5) (2,3,0)

Design of water tight sections of tanks, industrial projects and sea-shore buildings– Analysis and design of tanks– Rectangular tanks whether elevated, ground or underground– Deep tanks– Shallow tanks– Circular tanks whether elevated tanks or ground tanks- Design of deep beams – Structural analysis and design of concrete structures subjected to earthquake loads– Beam-column connections– Design is carried out according to the Egyptian Code of Practice for Reinforced Concrete Structures and the Egyptian Code for Loads.

References:

1- Lecture notes and handouts prepared by the staff members
2- ECP 203-2020 Egyptian Code for Design and Construction of Concrete Structures, Ministry of Housing, Utilities and Urban Communities, Giza, Egypt.
3- Egyptian Code of Practice: ECP 201-(2012), “Egyptian Code for Calculating Loads and Forces in Structural Work and Masonry,” Ministry of Building Construction, Research Center for Housing, Building and Physical Planning, Cairo, Egypt.
4- Design Aids, Ministry of Housing, Utilities and Urban Communities, Giza, Egypt, 2018.
5- Theory and Design of Reinforced Concrete Tanks by M. HILLAL, 2015.

CIV424 Sanitary Engineering (2,2,0)

Preliminary studies of water supply – Population forecasting - Water sources & water consumption- purification works diagram- Design of collection works- Coagulation-Flocculation- Sedimentation- filtration–Disinfection– Pipe networks–Wastewater sources and characteristics.

References:

1- *Lattemann S, Höpner T. Environmental impact and impact assessment of seawater* desalination. Desalination. 2008 Mar 1;220(1-3):1-5.
2- هندسة الصرف الصحى : هندسة صحية ، محمد صادق العدوي، دار صادق للطباعة والنشر
3- الهندسة الصحية، محمد علي فرج، مؤسسة المعارف للطباعة والنشر .

CIV460 Reinforced Concrete Special Structures (2,2,0)

Concrete bridge design- Types of Bridges- Solid slab bridges– Voided slab bridges– Girder bridges– Box girder bridges–Design of abutments and piers of bridges– Precast concrete elements- Design of Thin-walled structures: domes and cones- Design is carried out according to the Egyptian Code of Practice for Reinforced Concrete Structures and the Egyptian Code for

References:

1- ECP 203-2020 Egyptian Code for Design and Construction of Concrete Structures, Ministry of Housing, Utilities and Urban Communities, Giza, Egypt.
2- Theory and Design of Bridges, Petros P. Xanthakos
3- Bridge Deck Behavior, E. C. Hambly
4- AASHTO, Standard Specifications for Highway Bridges

CIV461 Steel Structures (4) (2,2,0)

Structural systems for industrial buildings - Distribution of lateral loads on industrial buildings and design of their lateral elements - Structural systems for multi-story buildings and distribution of lateral loads - Design of cold-formed sections subjected to bending moment and axial force – Design of welded and bolted connections under shear forces - Design of welded and bolted rigid connections.

References:

1- *Egyptian Code Practice for Design of Steel Structure and Bridges, latest edition*
2- *McCormac, "Structural steel Design", 4th Edition, ISBN – 0-06-500060-9*
3- *Eltobgy, H., Structural Steel Design, ASD-LRFD, first edition 2016, Dar Elmaarefa, Cairo, Egypt.*
4- *Machally E.B., "Structural systems for wind and earthquake loads", (volume II)", ISBN 977-19-6629-4*
5- *Galambos et al., "Basic Steel Design with LRFD", ISBN, 0-13-059577-2*
6- *Segui, W. T., LRFD Steel Design, Fourth Edition, 2007, Thompson, Brooks/Cole, USA.*

CIV462 Maintenance, Protection and Strengthening of Structures (2,2,0)

Repairing materials and methods of repair – Evaluation of structures to identify the requirements of Repair – Repair and strengthening using different materials – Maintenance of structures – Methods of protection of structures – Cathodic protection.

References:

1- *Egyptian code of practice and design of RC structures, 2013*
2- *Egyptian code for design aids for RC structures, 2014*
3- *Egyptian code for standard reinforcement detailing, 2014*
4- *Advanced repair methods of RC structures, 2010*

CIV463 Properties of Materials and Quality Control (2,2,0)

Construction materials and properties – Volume stability of hardened concrete – Durability of hardened concrete – Special types of concrete: high strength, under water, light weight, heavy weight, roller compacted, containing fibers, containing polymers, self-compacting, high performance– Concreting in hot and cold weather– Protection and repair of concrete.

References:

1- P. K. Mehta and P. J. M. Monteiro, "Concrete: Microstructure, Properties and Testing", 2nd Edition, McGraw-Hill Education (2013), ISBN-13: 978-0071797870
2- A.M. Neville, "Properties of Concrete", 5th Edition, Prentice Hall (2012), ISBN-13: 978-0273755807

CIV464 Advanced Uses of Computers in the Analysis and Design of Structures (2,2,0)

Space frames– Defined offsets– Inclined supports – Mixed elements – Introduction to programming methods and background for Finite Element Analysis Method – Key ideas and some structural examples – Different elements types – Computer applications – Some advanced topics – Analysis of structural elements of composite materials.

References:

1- A First Course in the Finite Element Method by Daryl L. Logan (PDF)
2- *A First Course in the Finite Element Method by Daryl L. Logan (PDF)*
3- *Egyptian code of practice and design of RC structures*
4- *Egyptian code for design aids for RC structures*
5- *Egyptian code for standard reinforcement deta iling*
6- *Design of concrete structures by A.H. Nilson, 2003*
7- *Reinforced concrete: mechanics & design by J.G. MacGreger, 2009*
8- *Design of reinforced concrete structures- V1 by M. Ghoneim*

CIV465 Design of Reinforced Wall-Bearing Structures (2,2,0)

Structural systems of wall-bearing masonry structures – Structural, constructional, architectural and economical aspects of reinforced wall-bearing masonry structures – Bond and steel connectors in masonry structural elements – Single brick walls, composite walls and cladding walls – Grouting and strengthening materials– Design of wall-bearing masonry structures according to the Egyptian code – Earthquake-resistant design.

References:

1- *Egyptian Code for Loads on Structures*
2- *Egyptian Code for Design and Construction of Reinforced Concrete Structures*
3- *Uniform Building Code for loads on structures*
4- *Park & Paulay "Reinforced concrete structures"*
5- *J.G. MacGregor "Reinforced Concrete Mechanics & Design".*

CIV466 Advanced Projects Management (1,2,0)

Financial planning – Financial calculations - Financial review and evaluation – Cash flow analysis – Financial alternatives – Contract administration – Project cost estimate – Project Monitor and control -Project evaluation (time and cost) - Project time reduction.

References:

1- *Tarek Hegazy (2013). Computer-Based Construction Project Management, ISBN-9781292027128, Pearson Education Limited, 2013, 360 pages, USA*

CIV467 Geotechnical Engineering and Foundations (3) (1,2,0)

Field investigations and tests – Application of field investigations to design – Seepage of water through soil – Flow nets below dams and excavations – Stability of slopes – Swelling problematic soil – Collapsible problematic soil – Design and execution of dewatering systems and ground water control – Analysis and design are according to Egyptian code for soil mechanics and foundations.

References:

1- Soil Strength and Slope Stability, Duncan et. al, John Wiley & Sons, 2014
2- Slope Stability Analysis and Stabilization – New Methods and Insight, Cheng and Lau, Taylor and Francis Group, 2008
3- Foundation on Expansive Soils, Fu Chen, Elsevier Science, 2012
4- Construction Dewatering and Groundwater Control, Powers et. al, John Wiley & Sons, 2007

CIV468 Railway Engineering (2,0,0)

Introduction, Thermal effects on railway tracks, Railway track buckling, Design of slab tracks Types and properties of slab tracks, Defects of railway tracks, Types of Railway track inspection and maintenance, Estimation of Maintenance Cost of railway tracks, Platform–train interface for rail passengers – technology review, Track transitions, Sub-ballast and subgrade improvement, Drainage systems of railway tracks, Railway track structural gauges, Modern technologies of Railways

References:

1. Bernahard Lichtberger, 2011. "Track Compendium". Eurail Press.
2. Lester A. Hoel, Nicholas J. Garber, Adel W. Sadek. (2011). "Transportation Infrastructure Engineering". Cengage Learning.
3. Buddhima Indraratna, "Ballast Railroad Design", 2018, CRC Press.
4. UIC - International union of railways web site. 2021, https://uic.org/

CIV469 Reinforced and Prestressed Concrete (2,0,0)

Prestressed concrete structures: Types of prestressing: Pre-tensioned and Post-tensioned concrete– Analysis and design of statically determinant and statically indeterminant structures to meet the working and ultimate load conditions– The use of advanced materials and techniques in concrete structures– Design is carried out according to the Egyptian Code of Practice for Reinforced Concrete Structures and the Egyptian Code for Loads.

References:

1- *Nawy, E. G., Prestressed Concrete – A Fundamental Approach, 5th Edition, Prentice-Hall, Inc., 2006.*
2- *Lin, T. Y. and Burns, N. H., Design of Prestressed Concrete Structures, 3rd*
3- Egyptian Code of Practice: ECP 203-(2020), "Design and Construction for Reinforced Concrete Structures," Research Center for Housing & Building, Cairo, Egypt.
4- *Nilson, A., Design of Prestressed Concrete, 2nd Edition, John Wiley & Sons,*

CIV458 Harbor Eng., Shoreline Protection and Internal Navigation (2,0,0)

Natural phenomena: wind, tides, coastal currents, waves– Port Planning: Planning Factors, Breakwaters and Planning– Port Elements Planning: Navigation Canal, Protected Area, Berths, Service Buildings– Design of port elements - Breakwaters: wall piles, concrete balconies, caissons, sidewalks, dry docks and means of ship repair– Navigation: Types of navigation channels, Hydraulic phenomena - The effect of passing boats - The effect of boats in limited water channels - Design and protection of navigation channels.

References:

1- Shore protection manua- Volume I & II - U.S. Army Corps of Engineers
2- Handbook of Coastal and Ocean Engineering - J. Herbich
3- Introduction to coastal and Harbor Engineering - M.M. Abou-Seida - Cairo University
4- هندسة الموانى والمنشات البحرية - د. علاء الدين فطين - هيئة قناة السويس - الاسماعيليه
5- هندسة الموانى والمنشات البحرية - ا.د. ابراهيم عبيدو - هيئة قناة السويس - الاسماعيليه

CIV491 Graduation Project (0,0,10)

Student is required to perform a project in one of the following fields: Reinforced Concrete Structures, Structural Analysis, Steel Structures and Materials.

References:

1- *The Egyptian code for the design of reinforced concrete structures. ECP 203, Housing and building research Centre. Ministry of housing, planning and new urban communities, Arab Republic of Egypt.*
2- *Neville, A.M. "Properties of Concrete", J, Wiley, ISBN: 0470235276 (1996).*
3- *Egyptian Code of Practice for Steel Construction and Bridges, ASD, (Allowable Stress Design), 2012.*
4- *Egyptian Code of Practice for Steel Construction (Load and Resistance Factor Design) (LRFD), Ministerial Decree No 359 – 2007, First Edition 2012.*
5- *El. Dakhakhny, W.M., "Theory of Structures", Part I & II, 9th edition, Dar-Al-Maaref, Cairo, Egypt, 1995, ISBN: 977-02-4790-1*
6- *Egyptian Standard Specifications, ESS, المواصفات القياسية المصرية للمواد, وزارة الصناعة, أخر إصدار*

Elective University Courses

GEN900 Communication & Presentation Skills (1,1,0)

General introduction to communication, the importance of communication, types of communication, communication barriers, listening skills, attributes and methods of reading, verbal communication: speaking and writing skills, non-verbal communication, dialogue skills and strategies of persuasion, communication in the work environment, writing CVs, reports and official letters.

References:

1- Gary Johns and Alan M. Saks, Organizational Behavior, Addison Wesley Longman, 2009.
2- Scgermerhorn, Jr., R. J., Hunt, G. J., and Osborn, N. R., Organizational Behavior, John Wiley & Sons, Inc., New York, 10th. Ed., 2008.

GEN902 Human Rights and Combating Corruption (1,1,0)

Human rights: general introduction, definition of human rights, characteristics and principles of human rights, general rules of the idea of human rights, historical development of the idea of human rights, types of human rights, individual rights, collective rights (people's rights), sources of human rights, legal system of rules of protection Human rights, human rights according to the Egyptian constitution in 2014, the duties and obligations of individuals in society. Combating corruption: definition of corruption, its causes, effects and characteristics, types of corruption and its causes, the impact of corruption on human rights and development, the impact of corruption on economic rights and sustainable development, criminal confrontation of corruption.

References:

1- Peter Joseph, The New Human Rights Movement: Reinventing the Economy to End Oppression, Inc. Blackstone Audio: Books, 2017

GEN903 Research and Analysis Skills (1,1,0)

Scientific thinking and its characteristics, definition of scientific research and its characteristics, steps of scientific research (selection of the subject of research, determine the problem of research and selection factors, determine the framework of research, determine the method of research, data analysis), types of scientific studies: exploratory studies, descriptive studies, experimental studies. Methods of scientific research: descriptive approach, social survey, content study, content analysis. Data collection tools:

Metrics, observation, interview, questionnaire. Data presentation and analysis methods: Descriptive methods, deductive methods.

References:

1- Gary Johns and Alan M. Saks, Organizational Behavior, Addison Wesley Longman, 2009.
2- Scgermerhorn, Jr., R. J., Hunt, G. J., and Osborn, N. R., Organizational Behavior, John Wiley & Sons, Inc., New York, 10th. Ed., 2008.

GEN901 Theory of Sustainability (1,1,0)

The course aims to introduce students to the concept of sustainability and its feasibility in order to develop its capabilities to reach architectural applications that contribute to achieving the goals of sustainability and its usefulness and to clarify the risks of unsustainable environment. The course deals with the components of the natural environment and the factors of preserving its components and equilibrium, the biological system, cycles and ecological chains, the presence characteristics of natural resources, energy and biological systems. Rapid development of sustainability applications and their comprehensiveness based on modern means of communication and digital technologies.

References:

1- Perspectives for a New Social Theory of Sustainability, Mariella Nocenzi and Alessandra Sannella, Springer Nature Switzerland 2020.

GEN904 Entrepreneurship (1,1,0)

Concepts in Entrepreneurship, Entrepreneurship and Small Enterprises, Generating Ideas for Entrepreneurial Projects, University and Entrepreneurship Opportunities and Challenges, Marketing Plan, Operational Plan, Financial Plan, Business Plan Writing, Technological Environment of Entrepreneurship, External Business Environment of Entrepreneurial Projects, Support Programs for Leading Projects Egyptian Economy, Entrepreneurial Project Presentation Skills.

References:

1- Entrepreneurship: An Evidence-Based Guide by Robert A Baron Edward Elgar Pub., 2012.

GEN905 Professional Ethics (1,1,0)

The course provides the background needed to discuss the core topics of engineering ethics, with a focus on the ethical issues facing engineers in the areas of engineering work in companies. The course includes the definition of the general elements of the ethics of the profession and the observance of the public interest and regulations and regulations,

obligations to the community, the responsibilities of engineers, disclosure of violations, behavior, basic principles and codes of the ABET code of conduct of engineers.

References:

1- William Frey, Professional Ethics in Engineering, November, 2013, http://cnx.org/content/col10399/1.4/

GEN908 Contracts and Legislation (1,1,0)

The course aims to provide the student with the technical and legislative knowledge related to the practice of the profession. The study of building legislation, urban planning and the laws governing the practice of the profession and the work systems (engineer / owner / contractor / ...) at the local and international levels as well as studying the methods of contracting/rules and systems for the preparation of integrated implementation documents. Tenders and methods of their examination and evaluation.

References:

1- Randall S. Schuler, Susan E. Jackson, Strategic Human Resoure Management , Wiley, 2nd ed., 2007.

2- Lewicki, J. R., Saunders, M. D., and Barry, B., Essentials of Negotiation, McGraw - Hill, 5th. Ed., 2011.

GEN906 Critical Thinking (1,1,0)

Theoretical concepts (memory, thinking, creativity), an introduction to the thinking skills, the nature of thinking (definition, characteristics, levels), types of thinking (creative, critical, scientific), cognitive thinking skills, meta-cognitive thinking skills, thinking measurement tools, strategies Used in the development of thinking skills, programs to teach thinking skills, methods of teaching thinking skills.

References:

1- Critical Thinking: A Beginner's Guide to Critical Thinking, Better Decision Making and Problem-Solving Paperback, by Jennifer Wilson,, Create Space Independent Publishing Platform 2017.

GEN907 Human Resources Management (1,1,0)

Historical development of human resources management, key functions of human resources management, human resources planning, access to human resources, training and development of human resources, compensation of human resources, human resource conservation.

References:

1- Human Resource Management, University of Minnesota Libraries Publishing, 2016

GEN909 Method of Scientific Research and Writing (1,1,0)

The course aims to develop the student's abilities to conduct applied scientific research in one of the fields presented for the graduation project and train to work within a research team, while following the steps of sound scientific research to draw conclusions. The elements and components of scientific research: research problem, scientific method to solve problems and fundamental differences between different scientific research methods, methods of collecting data and statistics necessary for research, methods of examination and analysis of data and information and scientific dealing with variables, formulation of research hypotheses, methods of discussion and examination of hypotheses, drawing conclusions. Scientific method of writing a scientific research (thesis writing). The students select one of the problems in the architectural, urban or any technical field, previously presented as the basis for the graduation project, to conduct the necessary scientific research. Finally, the student is discussed orally through a committee to evaluate the student's performance, within his group, and his findings, studies, analyzes, conclusions and recommendations for the graduation project thesis.

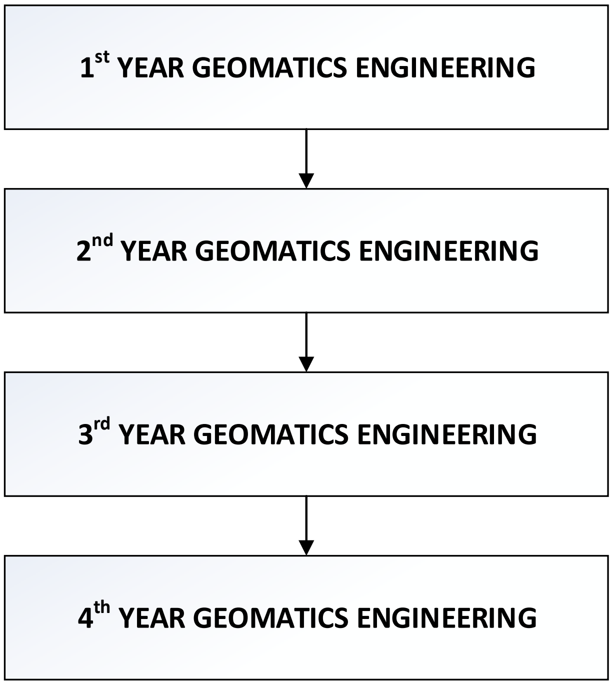
References:

1- Research Methodology and Scientific Writing, by C. George Thomas, Ane Books Pvt. Ltd., 2016

GEOMATICS ENGINEERING PROGRAM

GEOMATICS ENGINEERING DEPERTMENT
UNDERGRADUATE PROGRAM

The Geomatics Engineering Department contains only one academic undergraduate program “Geomatics Engineering”. The following diagram shows a general layout of the department.



GEOMATICS ENGINEERING PROGRAM

Program Information

1. Faculty vision:

The faculty of Engineering at Shoubra, Benha University, aspires to be a leading college at the national, regional and international level in the fields of engineering education, scientific research, innovation and entrepreneurship in order to achieve the sustainable development goals.

2. Faculty Mission

The faculty of Engineering at Shoubra is committed to prepare a graduate with competencies and problem-solving skills that qualify each engineer to compete in local and regional labor markets, the graduate will be able to innovate and become an entrepreneur, the faculty is also committed to the development of engineering sciences and producing internationally distinguished scientific research, within the framework of human values and social responsibility.

3. Program Vision

The geomatics engineering program looks forward to leadership and excellence in education and scientific research and community service in the various fields of geomatics at the local, regional and international level.

4. Program Mission

The Geomatics Engineering program is committed to preparing a graduate supplied with a broad and comprehensive education in the fundamentals of geomatics engineering and its applications, in addition to the skills necessary to meet the technical and social challenges in the future that qualify him to practice geomatics engineering with confidence at the professional level and compete in the labor market, with a commitment to human and moral values. The program is also committed to civil society institutions' participation and the provision of distinguished community services in fields related to geomatics engineering.

To judge the compatibility between the program mission and faculty mission, the following matrix is used:

Key Words of Faculty Mission / **Key Words of Program Mission**	...prepare a graduate with competencies and problem-solving skills....	...able to innovate and become an entrepreneur...	.... producing internationally distinguished scientific research......	.... with the framework of human values and social responsibility.
.... preparing a graduate supplied with a broad and comprehensive education in the fundamentals of geomatics engineering and its applications....	√			

....in addition to the skills necessary to meet the technical and social challenges in the future that qualify him to practice geomatics engineering with confidence at the professional level and compete in the labor market......		√		
.......commitment to human and moral values......				√
......committed to civil society institutions' participation and the provision of distinguished community services in fields related to geomatics engineering.		√		

5. Program aims

In pursuit of the program mission, the educational aims of Geomatics Engineering are:

1. Provide knowledge of mathematics, science, and engineering concepts to the solution of Geomatics engineering problems.
2. Offer advanced educational topics and to exploit modern scientific and practical techniques in order to prepare and qualify the students for improving their skills and raising their capabilities to the required market standards.
3. Ensure the ability of students to define, analyzing, and solving a wide range of logical, practical engineering problems using modern tools and techniques.
4. Guarantee that the graduates get a solid understanding of personal, professional integrity, and ethical responsibility in the practice of Geomatics processes.
5. Create a high-quality atmosphere within the Geomatics Engineering Department by means of laying specific plans for promotions, improvement, exploiting available skills and capabilities, as well as evolving them.
6. Use the techniques, skills, and appropriate engineering tools necessary for engineering practice and project management.
7. Work and Communicate effectively within multi-disciplinary teams.
8. Engage in self-and continuous learning.
9. Act professionally in the design and supervision of Geomatics Engineering projects.

To judge the compatibility of program mission with its objectives, the following matrix is used:

Key Words of Program Mission / **Program Aims**	…. preparing a graduate supplied with a broad and comprehensive education in the fundamentals of geomatics engineering and its applications….	….in addition to the skills necessary to meet the technical and social challenges in the future that qualify him to practice geomatics engineering with confidence at the professional level and compete in the labor market…..	…..commitment to human and moral values…..	…..committed to civil society institutions' participation and the provision of distinguished community services in fields related to geomatics engineering.
Provide knowledge of mathematics, science, and engineering concepts to the solution of Geomatics engineering problems.	√			
Offer advanced educational topics and to exploit modern scientific and practical techniques in order to prepare and qualify the students for improving their skills and raising their capabilities to the required market standards.	√	√		
Ensure the ability of students in defining, analyzing, and solving a wide range of logical, practical engineering problems using modern tools and techniques.		√		
Guarantee that the graduates get a solid understanding of personal, professional integrity, and ethical responsibility in the practice of geomatics processes.			√	
Create a high-quality atmosphere within the Geomatics Engineering Department by means of laying specific plans for promotions, improvement, exploiting available skills and capabilities, as well as evolving them.		√		
Use the techniques, skills, and appropriate engineering tools necessary for engineering practice and project management.	√	√		
Work and Communicate effectively within multi-disciplinary teams.		√		√
Engage in self-and continuous learning.	√	√		
Act professionally in the design and supervision of Geomatics Engineering projects		√		√

6. Graduate Attributes

The graduate of the Geomatics Engineering program will have the following attributes:

1. Able to collect all spatial and attribute data necessary for producing different kinds of maps for the natural and artificial features on the earth's surface using terrestrial, photogrammetric, and remote sensing techniques with appropriate scales to be used for diverse purposes, e.g., planning and decision making.
2. Deal with all Geomatics field instruments (GNSS/GPS, Laser scanners, Inertial Navigation System INS, Gravimeters, Total station, levels, ….), in addition to geomatics specialized softwares.
3. Carrying out all geomatics engineering works concerning civil and military applications.
4. Design problems-solving codes in different programming languages (MATLAB, C++, …).
5. Equipped with good communication skills and foreign language.

7. Program Competencies

According to the National Academic Reference Standard, the Geomatics Engineering program must satisfy the following Competencies:

1- General Engineering NARS Competencies in 2018		
Level A (NARS)	A1	Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.
	A2	Develop and conduct appropriate experimentation and/or simulation, analyze and interpret data, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.
	A3	Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the discipline and within the principles and contexts of sustainable design and development.
	A4	Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.
	A5	Practice research techniques and methods of investigation as an inherent part of learning.
	A6	Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.
	A7	Function efficiently as an individual and as a member of multi-disciplinary and multi- cultural teams.
	A8	Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.
	A9	Use creative, innovative and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.
	A10	Acquire and apply new knowledge; and practice self, lifelong and other learning strategies.
2- GEOMATICS ARS		

Level B (ARS)	B1	Apply the knowledge of mathematics, engineering sciences, information technology, and project planning.
	B2	Select the suitable tools and different technologies of field data gathering for Geomatics works according to the required accuracy.
	B3	Recognize applications of all new advanced Geomatics techniques, e.g., "Remote sensing, photogrammetry, Global Navigation Positioning Systems, geographical Information Systems".
	B4	Analyze remote sensing data and geo-information systems to create and solve actual models for problems
	B5	Be aware of basic law and regulation rules needed for different Geomatics works.
	B6	Commitment to ethics in dealing with all peoples/processes in all activities.
	B7	Deal with biddings, project management, international standards, and maintenance during project execution.

To judge the compatibility of program aims with its competencies, the following matrix is used:

Program Aims	**Program Competencies**																
	Level A (NARS)										**Level B (ARS)**						
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	B6	B7
#1	√										√						
#2					√				√				√	√			
#3				√									√	√			
#4			√	√												√	
#5					√			√									√
#6		√				√						√					√
#7							√	√								√	
#8					√					√							
#9			√	√		√									√		

PROGRAM REQUIREMENTS

Geomatics Engineering Program Requirements

#	Requirements	Contact Hours	%	% according to reference framework
1	Humanities & Social Sciences	20	8	8-12
2	Mathematics & Basic Sciences	64	25.6	25-30
3	Basic Engineering Subjects	63	25.2	25-30
4	Applied Engineering and Design	66	26.4	25-30
5	Business Administration	8	3.2	2-4
6	Engineering Knowledge	14	5.6	3-6
7	Projects & Training	15	6	3-6
		250	100	100

#	Subjects	Contact Hours	%	Min. Percentage according to reference framework (%)
1	University Requirements	20	8	8
2	Faculty Requirements	70	28	20
3	Major Specialization Subjects	100	40	35
4	Minor Specialization Subjects	60	24	Maximum 30
		250	100	

LIST OF COURSES

GEOMATICS ENGINEERING PROGRAM

No.	Code	Course	Contact Hrs				Credit Hours
			Lec.	Tut.	Lab.	Total	Total
University Requirements (20 Contact Hours) = (12 Credit Hours)							
1	GEN0x0	Elective - Language requirements List	2	0	0	2	2
2	GEN011	Computer Skills	1	0	1	2	1
3	GEN012	History of Engineering & Technology	2	0	0	2	2
4	GEN9xx	Elective - University Requirements list	1	1	0	2	1
5	GEN9xx	Elective - University Requirements list	1	1	0	2	1
6	GEN9xx	Elective - University Requirements list	1	1	0	2	1
7	GEN9xx	Elective - University Requirements list	1	1	0	2	1
8	GEN9xx	Elective - University Requirements list	1	1	0	2	1
9	GEN9xx	Elective - University Requirements list	1	1	0	2	1
10	GEN9xx	Elective - University Requirements list	1	1	0	2	1
Faculty Requirements (70 Contact Hours) = (42 Credit Hours)							
1	BAS010	Differential Calculus and Algebra	2	2	0	4	3
2	BAS011	Statics	2	1	2	5	3
3	BAS012	Engineering Chemistry	2	1	2	5	3
4	BAS013	Physics of Materials & Electricity	2	1	3	6	3
5	BAS014	Integral Calculus & Analytical Geometry	2	2	0	4	3
6	BAS015	Dynamics	2	1	2	5	3
7	BAS016	Physics of Light, Heat, and Magnetism	2	1	2	5	3
8	MEC010	Engineering Drawing (1)	0	3	0	3	1
9	MEC011	Production Technology & Workshops	1	0	2	3	2
10	MEC012	Engineering Drawing (2)	0	3	1	4	2
11	GED100	Summer training	0	0	0	0	0
12	GED102	Geology science	1	1	0	2	1
13	CIV173	Theory of structures	1	3	0	4	2
14	GED206	Engineering economy	2	2	0	4	3
15	MEC281	Electromechanical engineering	1	2	0	3	2
16	GED300	Field training (1)	0	0	0	0	0
17	CIV371	Design of concrete structures	2	2	0	4	3
18	GED400	Field training (2)	0	0	0	0	0
19	GED410	Study and management of engineering projects	2	2	0	4	3
20	GED490	Graduation Project	0	0	5	5	2

Major Specialization Subjects (100 Contact Hours) = (63 Credit Hours)							
1	BAS112	Differential equations	2	2	0	4	3
2	BAS115	Physics of light and laser	2	3	0	5	3
3	BAS116	Numerical analysis and Fourier series	3	3	0	6	4
4	GED101	Surveying (1)	2	1	3	6	3
5	GED103	Surveying (2)	2	1	3	6	3
6	GED104	Study of the atmosphere	2	0	0	2	2
7	GED105	Quantities and specifications of construction works	2	2	0	4	3
8	CIV172	Civil Drawing and Irrigation	1	3	0	4	2
9	ELE181	Computer Programming	1	0	4	5	2
10	GED200	Summer training (2)	0	0	0	0	0
11	GED201	Underground Surveying	2	1	1	4	3
12	GED202	Photogrammetry (1)	2	1	2	5	3
13	GED203	Geodesy (1)	2	1	2	5	3
14	GED204	Adjustment computations (1)	2	3	0	5	3
15	GED207	Design of roads, railways, and tunnels	2	3	0	5	3
16	GED209	Geodesy (2)	2	2	2	6	4
17	CIV271	Geotechnical Engineering and Foundation Design	2	2	0	4	3
18	ELE281	Computer applications (1)	2	1	2	5	3
19	GED301	Photogrammetry (2)	2	1	2	5	3
20	GED302	Map projection and cartography	2	1	1	4	3
21	GED304	Geographic information systems (1)	2	2	2	6	4
22	GED307	Computer applications (2)	2	1	1	4	3
Minor Specialization Subjects (60 Contact Hours) = (41 Credit Hours)							
1	GED303	Adjustment Computations (2)	2	2	0	4	3
2	GED306	Remote sensing (1)	2	2	2	6	4
3	GED 308	Geodesy (3)	2	1	2	5	3
4	xxx3xx	Specialized Elective (1) - List (1)	2	0	2	4	3
5	xxx3xx	Specialized Elective (2) - List (1)	2	0	2	4	3
6	GED402	Geographic information systems(2)	2	1	2	5	3
7	GED403	Physical Geodesy	2	2	0	4	3
8	GED404	Digital image processing	2	2	1	5	3
9	GED405	Remote sensing (2)	2	1	2	5	3
10	GED406	Photogrammetry (3)	2	2	2	6	4
11	GED408	Computer applications (3)	2	1	1	4	3
12	xxx4xx	Specialized Elective (3) – List (2)	2	0	2	4	3
13	xxx4xx	Specialized Elective (4) – List (2)	2	0	2	4	3

COURSES CLASSIFICATION
GEOMATICS ENGINEERING PROGRAM

No.	Code	Course	Contact Hrs			
			Lec.	Tut.	Lab.	Total
Humanities & Social Science Subjects (20 Contact Hours)						
1	GEN0x0	Elective - Language requirements List	2	0	0	2
2	GEN011	Computer Skills	1	0	1	2
3	GEN012	History of Engineering & Technology	2	0	0	2
4	GEN9xx	Elective - University Requirements list	1	1	0	2
5	GEN9xx	Elective - University Requirements list	1	1	0	2
6	GEN9xx	Elective - University Requirements list	1	1	0	2
7	GEN9xx	Elective - University Requirements list	1	1	0	2
8	GEN9xx	Elective - University Requirements list	1	1	0	2
9	GEN9xx	Elective - University Requirements list	1	1	0	2
10	GEN9xx	Elective - University Requirements list	1	1	0	2
Business Administration (8 Contact Hours)						
1	GED206	Engineering economy	2	2	0	4
2	GED 410	Study and management of engineering projects	2	2	0	4
Mathematics & Basic Sciences (64 Contact Hours)						
1	BAS010	Differentiation & Algebra	2	2	0	4
2	BAS011	Statics	2	1	2	5
3	BAS012	Engineering Chemistry	2	1	2	5
4	BAS013	Physics of Materials & Electricity	2	1	3	6
5	BAS014	Integral calculus & Analytical Geometry	2	2	0	4
6	BAS015	Dynamics	2	1	2	5
7	BAS016	Physics of Light, Heat, and Magnetism	2	1	2	5
8	BAS112	Differential Equations	2	2	0	4
9	BAS115	Physics of light and laser	2	3	0	5
10	BAS116	Numerical analysis and Fourier series	3	3	0	6
11	GED102	Geology Science	1	1	0	2
12	GED204	Adjustment computations (1)	2	3	0	5
13	GED303	Adjustment computations (2)	2	2	0	4
14	GED403	Physical Geodesy	2	2	0	4
Engineering Knowledge Subjects (14 Contact Hours)						
1	MEC011	Production technology and workshops	1	0	2	3
2	CIV173	Theory of structures	1	3	0	4
3	MEC281	Electromechanical Engineering	1	2	0	3
4	CIV371	Design of concrete structures	2	2	0	4

Basic Engineering Science Subjects (63 Contact Hours)						
1	MEC 010	Engineering Drawing (1)	0	3	0	3
2	MEC 012	Engineering Drawing (2)	0	3	1	4
3	GED101	Surveying (1)	2	1	3	6
4	GED103	Surveying (2)	2	1	3	6
5	GED104	Study of the atmosphere	2	0	0	2
6	GED105	Quantities and specifications	2	2	0	4
7	CIV172	Civil Drawing and Irrigation	1	3	0	4
8	GED201	Underground Surveying	2	1	1	4
9	GED207	Design of roads, railways, and tunnels	2	3	0	5
10	CIV271	Geotechnical Engineering and Foundation Design	2	2	0	4
11	GED302	Map projection and Cartography	2	1	1	4
12	GED304	Geographic information systems (1)	2	2	2	6
13	GED 306	Remote sensing (1)	2	2	2	6
14	GED404	Digital image processing	2	2	1	5
Applied Engineering and Design Subjects (66 Contact Hours)						
1	ELE181	Computer Programming	1	0	4	5
2	GED202	Photogrammetry (1)	2	1	2	5
3	GED203	Geodesy (1)	2	1	2	5
4	GED209	Geodesy (2)	2	2	2	6
5	ELE281	Computer applications (1)	2	1	2	5
6	GED301	Photogrammetry (2)	2	1	2	5
7	GED 307	Computer applications (2)	2	1	1	4
8	xxx3xx	Specialized Elective (1) - List (1)	2	0	2	4
9	xxx3xx	Specialized Elective (2) - List (1)	2	0	2	4
10	GED402	Geographic information systems (2)	2	1	2	5
11	GED406	Photogrammetry (3)	2	2	2	6
12	GED408	Computer applications (3)	2	1	1	4
13	xxx4xx	Specialized Elective (3) – List (2)	2	0	2	4
14	xxx4xx	Specialized Elective (4) – List (2)	2	0	2	4
Projects and Field Training Subjects (15 Contact Hours)						
1	GED100	Summer training	0	0	0	0
2	GED200	Summer training (2)	0	0	0	0
3	GED300	Field training (1)	0	0	0	0
4	GED308	Geodesy (3)	2	1	2	5
5	GED400	Field Training (2)	0	0	0	0
6	GED405	Remote sensing (2)	2	1	2	5
7	GED490	Graduation Project	0	0	5	5

STUDY PLAN

PREPARATORY YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
BAS010	Differential Calculus and Algebra	2	2	0	4	60	0	60	120	3
BAS011	Statics	2	1	2	5	45	30	75	150	3
BAS012	Engineering Chemistry	2	1	2	5	45	30	75	150	3
BAS013	Physics of Materials & Electricity	2	1	3	6	45	45	90	180	3
MEC010	Engineering Drawing (1) ×	0	3	0	3	25	20	45	90	3
GEN0x0	Elective - Language requirements List	2	0	0	2	30	0	30	60	2
		10	**8**	**7**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
BAS014	Integral Calculus & Analytical Geometry	2	2	0	4	60	0	60	120	3
BAS015	Dynamics	2	1	2	5	45	30	75	150	3
BAS016	Physics of Light, Heat and Magnetism	2	1	2	5	45	30	75	150	3
MEC011	Production Technology & Workshops†	1	0	2	3	25	20	45	90	3
MEC012	Engineering Drawing (2) ×	0	3	1	4	30	30	60	120	3
GEN011	Computer Skills ×	1	0	1	2	15	15	30	60	2
GEN012	History of Engineering & Technology	2	0	0	2	30	0	30	60	2
		10	**7**	**8**	**25**				**750**	

† In workshops, students are divided into groups 15 students/each, and a faculty stuff member (or an assistant) as well as a practical trainer will teach the group.

× In course MEC011, students are divided into groups 15 students/each. Two faculty stuff members or their assistants will teach each group.

FIRST YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
BAS112	Differential equations	2	2	0	4	60	0	60	120	3
BAS115	Physics of light and laser	2	3	0	5	40	35	75	150	3
GED101	Surveying (1)	2	1	3	6	45	45	90	180	3
GED102	Geology Science	1	1	0	2	30	0	30	60	2
CIV172	Civil Drawing and irrigation*	1	3	0	4	60	0	60	120	3
CIV173	Theory of Structures	1	3	0	4	60	0	60	120	3
		9	**13**	**3**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
GED103	Surveying (2)	2	1	3	6	45	45	90	180	3
GED104	Study of the Atmosphere	2	0	0	2	30	0	30	60	2
GED105	Quantities and specifications of Construction Works	2	2	0	4	60	0	60	120	3
GEN9xx	Elective - University Requirements list	1	1	0	2	20	10	30	60	2
BAS116	Numerical analysis and Fourier series	3	3	0	6	90	0	90	180	3
ELE181	Computer Programming	1	0	4	5	40	35	75	150	3
		11	**7**	**7**	**25**				**750**	

* Prior to registering in first year, the student should have completed 3 weeks of training (GED100) in engineering drawing on steel and irrigation facilities works in summer for 5 days per week. The daily training is for 6 hours (3 hrs. Lecture + 3 hrs. tutorial), amounting to a total of 30 hours per week. A maximum grade of 25 marks is added to the 'semester work' grades of the civil drawing and irrigation engineering (CIV172) course of first year.

SECOND YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
GED201	Underground Surveying	2	1	1	4	30	30	60	120	3
GED202	Photogrammetry (1)	2	1	2	5	40	35	75	150	3
GED203	Geodesy (1) *	2	1	2	5	45	30	75	150	3
GED204	Adjustment Computations (1)	2	3	0	5	75	0	75	150	3
GED 206	Engineering Economy	2	2	0	4	30	30	60	120	3
GEN9xx	Elective - University Requirements list	1	1	0	2	20	10	30	60	2
		11	**9**	**5**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
GED207	Design of Roads, Railways and Tunnels	2	3	0	5	75	0	75	150	3
GED209	Geodesy (2)	2	2	2	6	45	45	90	180	3
GEN9xx	Elective - University Requirements list	1	1	0	2	20	10	30	60	2
CIV271	Geotechnical Eng. & Foundation Design	2	2	0	4	60	0	60	120	3
ELE281	Computer applications (1)	2	1	2	5	40	35	75	150	3
MEC281	Electromechanical Engineering	1	2	0	3	45	0	45	90	3
		10	**11**	**4**	**25**				**750**	

* Prior to registering in second year, the student should have completed 4 weeks of summer training (GED200) on surveying works for 5 days per week. The daily training is for 6 hours (1 hr. Lecture + 1 hr. tutorial + 4 hrs. Field and Lab.), amounting to a total of 30 hours per week. A maximum grade of 20 marks is added to the 'semester work' grades of the Geodesy (1) (GED203) course of second year.

THIRD YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
GED300	Field Training (1)	0	0	0	0	15	15	0	30	-
GED301	Photogrammetry (2)	2	1	2	5	40	35	75	150	3
GED303	Adjustment Computations (2)	2	2	0	4	55	0	55	110	3
GED304	Geographic Information Systems (1)	2	2	2	6	45	45	90	180	3
GEN9xx	Elective - University Requirements list	1	1	0	2	20	10	30	60	2
xxx3xx	Specialized Elective (1) - List (1)	2	0	2	4	30	30	60	120	3
CIV371	Design of Concrete Structures	2	2	0	4	50	0	50	100	3
		11	**8**	**6**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
GED302	Map Projection and cartography	2	1	1	4	30	30	60	120	3
GED306	Remote Sensing (1)	2	2	2	6	45	45	90	180	3
GED307	Computer Applications (2)	2	1	1	4	30	30	60	120	3
GED308	Geodesy (3)	2	1	2	5	40	35	75	150	3
GEN9xx	Elective - University Requirements list	1	1	0	2	20	10	30	60	2
xxx3xx	Specialized Elective (2) - List (1)	2	0	2	4	30	30	60	120	3
		11	**6**	**8**	**25**				**750**	

- Prior to registering in third year, the student undergoes Field Training 1 (GED300) for 4 weeks during the summer vacation, in a firm or project site in a related field. Every 5 students are supervised by a staff member of the department, (this supervision is not included in the staff member's teaching load).

FOURTH YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
GED 400	Field Training (2)	0	0	0	0	15	15	0	30	-
GED402	Geographic Information Systems (2)	2	1	2	5	40	35	75	150	3
GED403	Physical Geodesy	2	2	0	4	55	0	55	110	3
GED404	Digital Image Processing	2	2	1	5	40	35	75	150	3
GED405	Remote Sensing (2)	2	1	2	5	40	35	75	150	3
GEN9xx	Elective - University Requirements list	1	1	0	2	20	10	30	60	2
xxx4xx	Specialized Elective (3) - List (2)	2	0	2	4	25	25	50	100	3
		11	**7**	**7**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
GED406	Photogrammetry (3)	2	2	2	6	45	45	90	180	3
GED408	Computer Applications (3)	2	1	1	4	25	30	55	110	3
GED 410	Study and Manage. Of Eng. Project	2	2	0	4	50	0	50	100	2
GEN9xx	Elective - University Requirements list	1	1	0	2	20	10	30	60	2
GED490	Graduation Project*	0	0	5	5	80	120	-	200	-
xxx4xx	Specialized Elective (4) - List (2)	2	0	2	4	25	25	50	100	3
		9	**6**	**10**	**25**				**750**	

- Prior to registering in fourth year, the student undergoes Field Training 2 (GED400) for 4 weeks during the summer vacation, in a firm or project site in a related field. Every 5 students are supervised by a staff member of the department, (this supervision is not included in the staff member's teaching load).

* After completing the second semester, the students are divided into groups and continue performing the graduation project for 6 weeks.

LIST OF ELECTIVE COURSES FOR

LIST OF TECHNICAL LANGUAGES ELECTIVE COURSES

#	Code	Contact Hours	Contact Hrs			
			Lec.	Tut.	Lab.	Total
1	GEN010	English Language	2	0	0	2
2	GEN020	German Language	2	0	0	2
3	GEN030	French Language	2	0	0	2

LIST OF ELECTIVE COURSES FROM UNIVERSITY REQUIREMENTS

#	Code	Contact Hours	Contact Hrs			
			Lec.	Tut.	Lab.	Total
1	GEN900	Communication & Presentation Skills	1	1	0	2
2	GEN901	Theory of Sustainability	1	1	0	2
3	GEN902	Human Rights and Combating Corruption	1	1	0	2
4	GEN903	Research & Analysis Skills	1	1	0	2
5	GEN904	Entrepreneurship	1	1	0	2
6	GEN905	Professional Ethics	1	1	0	2
7	GEN906	Critical Thinking	1	1	0	2
8	GEN907	Human Resources Management	1	1	0	2
9	GEN908	Contracts and Legislation	1	1	0	2
10	GEN909	Method of Scientific Research and Writing	1	1	0	2

LIST OF SPECIALIZED ELECTIVE COURSES
GEOMATICS ENGINEERING PROGRAM

#	Code	Contact Hours	Contact Hrs			
			Lec.	Tut.	Lab.	Total
List (1) of Specialized Elective Courses						
1	GED331	Close range photogrammetry	2	0	2	4
2	GED332	Adjustment and maintenance of instruments	2	0	2	4
3	GED333	Hydrographic Surveying	2	0	2	4
4	CIV372	Transportation planning and traffic Engineering	2	0	2	4
List (2) of Specialized Elective Courses						
1	GED431	Surveying Engineering applications	2	0	2	4
2	GED432	Digital Terrain models	2	0	2	4
3	GED433	Spatial Data analysis	2	0	2	4
4	CIV471	Utilities planning	2	0	2	4

Matrix correlating program courses and program competencies

N.	Course code	Course title	Program Competencies																
			Level A										Level B						
			A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	B6	B7
1	BAS010	Differential Calculus and Algebra	√							√									
2	BAS011	Statics	√							√									
3	BAS012	Engineering Chemistry	√							√									
4	BAS013	Physics of Materials & Electricity	√							√									
5	MEC010	Engineering Drawing (1) ×	√			√				√									
6	BAS014	Integral Calculus & Analytical Geometry	√							√									
7	BAS015	Dynamics	√							√									
8	BAS016	Physics of Light, Heat and Magnetism	√							√									
9	MEC011	Principles of Manufacturing Engineering†	√			√			√										
10	MEC012	Engineering Drawing (2) ×	√			√				√									
11	GEN011	Computer Skills ×	√	√							√								
12	GEN012	History of Engineering & Technology				√	√												
13	GEN0x0	Elective - Language requirements List								√									
14	GED101	Surveying (1)	√				√			√				√			√		
15	CIV 172	Civil Drawing and irrigation *	√			√				√									
16	CIV 173	Theory of Structures		√	√	√							√						
17	BAS 112	Differential equations	√							√			√						
18	BAS 115	Physics of light and laser	√							√			√						
19	GED100	Summer training			√	√	√	√	√	√	√		√	√	√		√		√
20	GED102	Geology science					√			√		√		√					√
21	GED 103	Surveying (2)	√				√							√			√		

N.	Course code	Course title	Program Competencies																
			Level A										Level B						
			A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	B6	B7
22	GED 104	Study of the Atmosphere				√			√					√		√			
23	GED 105	Quantities and specifications of Construction Works	√				√	√					√				√	√	√
24	ELE 181	Computer Programming	√	√							√								
25	BAS 116	Numerical analysis and Fourier series	√	√						√				√					
26	GEN900	Communication & Presentation Skills							√	√									
27	GED 201	Underground Surveying	√			√	√						√	√	√				
28	GED 202	Photogrammetry (1)	√					√					√	√	√		√		√
29	GED 203	Geodesy (1)	√				√					√			√				
30	GED 204	Adjustment Computations (1)	√	√									√	√					
31	GED 206	Engineering Economy			√			√											√
32	GEN902	Human Rights and Combating Corruption			√												√	√	
33	GED 200	Summer training (2)			√	√	√	√	√	√	√		√	√	√		√		√
34	GED 207	Design of Roads, Railways, and Tunnels	√		√		√	√						√			√		√
35	GED 209	Geodesy (2)	√				√				√	√		√			√		
36	ELE 281	Computer applications (1)	√	√							√								
37	CIV 271	Geotechnical Eng. & Foundation Design		√	√	√													
38	MEC 281	Electromechanical Engineering	√										√						
39	GEN903	Research & Analysis Skills		√			√				√			√		√			
40	GED 301	Photogrammetry (2)	√	√						√		√	√		√				
41	GED 302	Map Projection and Cartography	√				√				√	√	√				√		
42	GED 303	Adjustment Computations (2)	√	√			√						√	√					
43	GED 304	Geographic Information Systems (1)		√		√					√			√	√				
44	CIV 371	Design of Concrete Structures			√	√		√											
45	xxx3xx	Specialized Elective (1) - List (1)	√	√	√	√	√						√	√	√				
46	GEN908	Contracts and Legislation															√	√	

N.	Course code	Course title	Program Competencies																
			Level A										Level B						
			A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	B6	B7
47	GED 300	Field Training (1)			√	√	√	√	√	√	√		√	√	√		√		√
48	GED 306	Remote Sensing (1)	√	√		√				√			√		√				
49	GED 307	Computer Applications (2)	√	√									√	√		√			
50	GED 308	Geodesy (3)	√	√			√						√	√	√				
51	xxx3xx	Specialized Elective (2) - List (1)	√	√	√	√	√						√	√	√				
52	GEN905	Professional Ethics																√	
53	GED400	Field Training (2)			√	√	√	√	√	√	√		√	√	√		√		√
54	GED 402	Geographic Information Systems (2)		√		√					√			√	√				
55	GED 403	Physical Geodesy		√		√	√					√	√	√	√				
56	GED 404	Digital Image Processing										√	√	√		√			
57	GED 405	Remote Sensing (2)	√	√		√				√			√		√				
58	xxx4xx	Specialized Elective (3) - List (2)	√	√	√	√	√	√					√	√	√				
59	GEN906	Critical Thinking		√			√				√								
60	GED 406	Photogrammetry (3)	√	√		√				√			√		√				
61	GED 408	Computer Applications (3)	√	√		√							√	√		√			
62	GED 410	Study and Manage. Of Eng. Projects		√	√		√	√	√					√	√			√	
63	GED490	Graduation Project*			√	√	√	√	√	√	√		√	√	√	√	√		√
64	xxx4xx	Specialized Elective (4) - List (2)	√	√	√	√	√	√					√	√	√				
65	GEN907	Human Resources Management				√		√	√	√	√								√

GEOMATICS ENGINEERING PROGRAM TREE

PREPARATORY YEAR

Semester							
First Semester	BAS010 Differential Calculus and Algebra	BAS011 Differential Calculus and Algebra	BAS012 Engineering Chemistry	BAS013 Physics of Materials & Electricity	MEC010 Engineering Drawing (1) ×	GEN0x0 Elective - Language requirements List	
Second Semester	BAS014 Integral Calculus & Analytical Geometry	BAS015 Dynamics	BAS016 Physics of Light, Heat and Magnetism	MEC011 Production Technology & Workshops†	MEC012 Engineering Drawing (2) ×	GEN011 Computer Skills ×	GEN012 History of Engineering & Technology

FIRST YEAR

Semester						
First Semester	GED101 Surveying (1)	CIV172 Civil Drawing and irrigation*	CIV173 Theory of Structures	BAS112 Differential equations	BAS115 Physics of light and laser	GED102 Geology Science
Second Semester	GED103 Surveying (2)	GED104 Study of the Atmosphere	GED105 Quantities and specifications of Construction Works	ELE181 Computer Programming	BAS116 Numerical analysis and Fourier series	GEN9xx Elective - University Requirements list

SECOND YEAR

Semester							
First Semester	GED 201 Underground Surveying	GED 202 Photogrammetry (1)	GED 203 Geodesy (1)	GED 204 Adjustment Computations (1)	GED 206 Engineering Economy	GEN9xx Elective - University Requirements list	GEN 200 Field training (1)
Second Semester	GED 207 Design of Roads, Railways and Tunnels	GED 209 Geodesy (2)	ELE 281 Computer applications (1)	CIV 271 Geotechnical Eng. & Foundation Design	MEC 281 Electromechanical Engineering	GEN9xx Elective - University Requirements list	

THIRD YEAR

Semester							
First Semester	GED 301 Photogrammetry (2)	GED 303 Adjustment Computations (2)	GED 304 Geographic Information Systems (1)	CIV 371 Design of Concrete Structures	xxx3xx Specialized Elective (1) - List (1)	GEN9xx Elective - University Requirements list	GED 300 Field Training (1)
Second Semester	GED 302 Map Projection and Cartography	GED 306 Remote Sensing (1)	GED 307 Computer Applications (2)	GED 308 Geodesy (3)	xxx3xx Specialized Elective (2) - List (1)	GEN9xx Elective - University Requirements list	

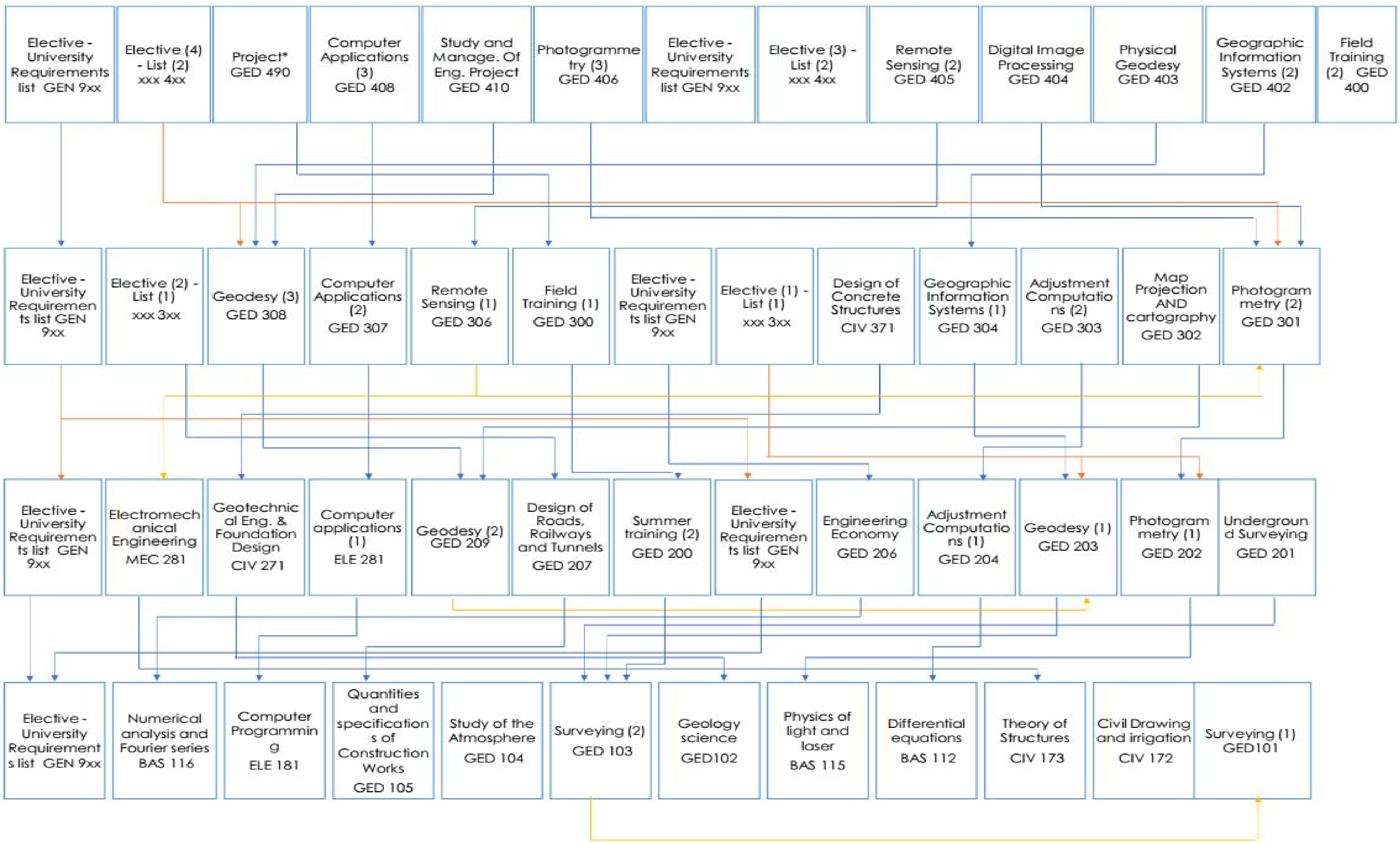
FOURTH YEAR

Semester							
First Semester	GED 400 Field training (2)	GED 402 Geographic Information Systems (2)	GED 403 Physical Geodesy	GED 404 Digital Image Processing	GED 405 Remote Sensing (2)	xxx4xx Specialized Elective (3) - List (2)	GEN9xx Critical Thinking
Second Semester	GED 406 Photogrammetry (3)	GED 408 Computer Applications (3)	GED 490 Project*	GED 410 Study and Management of Eng. Projects	xxx4xx Specialized Elective (4) - List (2)	GEN9xx Elective - University Requirements list	

Elective Courses

List (1) of Elective Courses	List (2) of Elective Courses
GED331 Close range photogrammetry	GED431 Surveying Engineering applications
GED332 Adjustment and maintenance of instruments	GED432 Digital Terrain models
GED333 Hydrographic Surveying	GED433 Spatial Data analysis
CIV372 Transportation planning and traffic Engineering	CIV471 Utility planning

GEOMATICS ENGINEERING PROGRAM COURSES (PREREQUISITES TREE)



Courses Description

GEOMATICS ENGINEERING PROGRAM
COURSES DESCRIPTION

GED101 Surveying 1 (2,1,3)

Surveying Definitions - Linear and angular measurements – Scales - Types of Bearings - Observations and coordinate calculations of closed and connected traverses – Adjustment of traverses - Problem of missing observations – Methods of Setting out – Calculation of areas and volumes - Different methods of land Division - Intersection and resection problem - Sources of errors - Production of cadastral maps – Progress report writing.

List of References

a- Course Notes

1- Course notes prepared by instructor

b- Books

1- Ghilani, C.D. and Wolf, P.R., 2008. Elementary Surveying: An Introduction to Geomatics. Prentice Hall Publishing, USA.

c- Recommended Books

1- Chandra, A.M., 2007. Plane Surveying. Second Edition. New Age International publishers, New Delhi, India.

CIV172 Civil Drawing and Irrigation (1,3,0)

Civil Drawing: Steel drawings – Steel sections – Steel elements – Connections - Details of steel beams -Foundations - Irrigation drawings. Irrigation Engineering: classification of Hydraulic establishments – Dams– Reservoirs– Tanks– Covered drainage channels–Tunnels– Syphon– Culverts– Surface Drainage – Water slopes– Sewers– Artificial irrigation cannels– Excess drainage channel– Cataracts– Water conveyance structures– Short channels (suspended and open)– Irrigation outlet regulators and their components– Different methods for irrigation spray and dripping networks design.

List of References

a- Course Notes

1- Course notes prepared by instructor.

b- Books

c- Recommended Books

1- Elalfy, Y.M., "Civil Drawing for Students and Engineers", El HakeemPub., first ed.,

CIV173 Theory of Structures (1,3,0)

Selected Topics– Statics Revision– Types of moments and their definition statically– Types of loads– Internal forces in beams– Internal force in structures– Trusses' analysis– Vertical stresses and shear stresses– Design of a reinforced concrete section.

List of References

a- Course Notes

1- Course notes and Solved examples prepared by instructor.

b- Books

1- El-Dakhakhny, 2004, "Structural Analysis" Part I, 8th ed., Dar-Al-Maaref, Cairo, Egypt. ISBN: 977 – 246-664-3.

c- Recommended Books

1- Beer, F.P., and Johnston, E.R., 2001, "Mechanics of Materials", McGraw Hill, 5th ed.

2 -Bazant, Zdenek P.; Cedolin, Luigi, 2010, "Three-Dimensional Continuum Instabilities and Effects of Finite Strain Tensor", chapter 11 in "Stability of Structures", 3rd ed. Singapore, New Jersey, London: World Scientific Publishing.

BAS112 Differential Equations (2,2,0)

Functions of several variables, Partial differentiation, Maximum and minimum values, Conditional extrema, Curvature, Double and triple integrals, Line integral, Ordinary differential equations, first order and higher order, Linear Systems of ordinary differential equations, Vectors analysis, Gradient, Laplace transformations, Inverse Laplace transformations.

List of References

a- Course Notes

1- Course notes prepared by instructor.

b- Books

1- Glyn James. 2008, Modern Engineering Mathematics, 4th ed., Prentice Hall, Harlow

2- Larson, R &Falvo, D. 2009, Elementary linear algebra, 6th ed., Houghton Mifflin Ha

c- Recommended Books

1-Stewart, J. 2006, Calculus: concepts & contexts, 3rd edn.

2-Tobies, Renate and Helmut Neunzert. 2012, Iris Runge: A Life at the Crossroads of M and Industry.

d- Web Sites

1- www.mathematicsresearch.com

BAS115 Physics of Light and Laser (2,3,0)

Definition and preliminary laws of light - Polarization - Interference - Laser principles - Types of Lasers - Characteristics and uses of waves - Wave interference - Wave reflection - Wave absorption - Electromagnetic wave - wave motion in vacuum and other media - Calculation of distances from waves - Use of waves in the formation of images Weather and satellite images and calculation the medium effect.

List of References

a- Course Notes

1- Course notes prepared by instructor

b- Books

2- N.Subrahmany and Brij LAL (2004). “Text book of optics”. Department of physics,

c- References

1- Malte C. Gather &Seok Hyun Yun (2011). "Single-cell biological lasers". Nature Pl

GED102 Geology Science (1,1,0)

Introduction to Geology – Types of soil – Crustal movement and continental drift – Minerals – Rocks– Primary and Secondary structures– Representation of layers and layers affecting faults -Hydrology (Dams – Underground and surface water reservoirs – Flood catchments and streams) – Geological maps.

List of References

a- Course Notes

1- Course notes prepared by instructor.

b- Books

1- Bell, F.G. Engineering Geology. Second edition. Elsevier Ltd. 2007.

c- Recommended Books

1- Grotzinger J., Jordan T., Press F. and Siever R. Understanding Earth. 2007.
2- Parriaux A. Freeman Geology – Basics for engineers. CRCPress/Balkema. 2009.
3- Gonzalez de Vallejo L. Geological engineering. CRC Press. 2011.

d- Web Sites

N.A

GED103 Surveying 2 (2,1,3)

Electronic distance measurements - Modern leveling instruments - leveling types and applications - longitudinal and cross sectional leveling - Sources of errors in leveling-Earthwork Computation – Different methods of representing land topography - contour maps and their uses – setting out horizontal and vertical curves of different types.

List of References

a- Course Notes

1- Course notes prepared by instructor

b- Books

1- Ghilani, C.D. and Wolf, P.R., 2008. Elementary Surveying: An Introduction to Geomatics. Prentice Hall Publishing, USA.

c- Recommended Books

1- Chandra, A.M., 2007. Plane Surveying. Second Edition. New Age International publishe New Delhi, India.

GED104 Study of the Atmosphere (2,0,0)

Atmosphere - Study of the formation of the layers surrounding the Earth - vertical composition of the atmosphere - the effect of the atmosphere layers on the rays and waves that penetrate them - movement in the atmosphere – pressure and temperature maps - study of the effect of heat and pressure on observations.

List of References

a- Course Notes

1- Course notes prepared by instructor

b- Recommended Books

1- Ahrens, C.D. (2010). "Essentials of Meteorology: An Invitation to the Atmosphere'
2- G. Kopp, Greg; J. Lean (2011). "A new, lower value of total solar irradiance: Evide
3- Wang, Y.-M.; Lean, J. L.; Sheeley, N. R. (2005). "Modeling the Sun's magnetic fiel

c- Web Sites

1- Fes4surveying@wordpress.com

GED105 Quantities and Specifications of Construction Works (2,2,0)

Types of buildings and specifications - Calculation of excavation of foundations - Calculation of plain and reinforced concrete works for foundations - Calculation of insulating layers - Calculation of earthworks - Calculation of concrete works for columns, beams and slabs - Calculation of brick work - Calculation of plaster, paint and flooring – Specifications.

List of References

a- Course Notes

1- Course notes prepared by instructor.

b- Books

1- Rosen, H. & J. Regener (2004), Construction specification writing: Principles and procedures, Blackwell Science.

c- Recommended Books

1- Construction Specifications Institute (2004) The project resource manual: CSI Manual of practice, CSI.
2- Emmitt, S. & D. Yeomans (2001) Specifying buildings: a design management perspective, Butterworth Heinemann.
3- Ambrose, James (2012) Building Structures. Hoboken, New Jersey, John Wiley & Sons.

d- Web Sites

1- www.icis.org
2. www.natspec.com.au
3.https://secure.spex.ca/

ELE181 Computer Programming (1,0,4)

Structured Programming Language- Algorithm Design- Flowcharts- Input/Output- Control Structures- Functions- Arrays- mathematical operations on arrays - Data storage.

List of References

a- Course Notes prepared by instructor:

b- Giloi, Wolfgang, K. (1997) "The First High-Level "non von Neumann Programming Language".

BAS116 Numerical Analysis and Fourier Series (3,3,0)

Fourier series, Harmonic functions, Fourier integrals, , Double integral, Solution of initial boundary value problems, Numerical analysis, Numerical differentiation and integration, Curve fitting, Finite differences and divided differences.

List of References

a- Course Notes

1- Course notes prepared by instructor.

b- Books

1- Gilbert Strang. Linear Algebra and Its Applications. Thomson Brooks/Cole. 2006

2- Richard Kaye and Robert Wilson. Linear Algebra. Oxford science publications. 1998

c- Recommended Books

1- Larson, R & Falvo, D. Elementary linear algebra. 6th ed. Houghton Mifflin Harcourt. Boston.2009.

d- Web Sites

1- www.mathematicsresearch.com

GED100 Summer Training

The duration of the training is three weeks (five days a week for 6 hours per day) with a total of 90 hours (6 hours/15 days) - in which the student performs training in drawing work for Steel and irrigation facilities. The training score is calculated at 25 degrees of the total work of the year for the drawing and Irrigation Engineering (CIV 172) of the first year.

GED201 Underground Surveying (2,1,2)

Introduction - Underground traverses - Underground working conditions and the Surveying instruments used - Indirect connection through horizontal tunnel or inclined shaft – Indirect Connections through one or two shafts. Direct light connectivity - Gyroscope connectivity - Underground vertical control station – Terrestrial photogrammetry in quarries - Ground radar and its applications in infrastructure - directing giant tunneling machines.

List of References

List of References

a- Course Notes

1- Course notes prepared by instructor.

b- Books

1- Anderson, E.G(1982)"The impact of new Gyro-Theodolite Technology design on under-
Ground survey"
2- Proceedings of the 4th Canadian Symposium on mining surveying and deformation
measurements, Bnaff , Alberta, Canada.

GED202 Photogrammetry 1 (2,1,2)

Introduction – History of Photogrammetry – Principles of Photography – Types of Cameras – Aerial Camera – Image Measurements – Vertical Photo Computations – Relief Displacement – Stereoscopic Vision – Stereoscopic Parallax – Tilted Photo Computations – Plane Rectification – Ground Control for Aerial Photogrammetry – Planning of Aerial Photogrammetric projects – Orientation and Aerial Triangulation on Stereo-plotters.

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List of References

a- Recommended Books

1- Wolf, P. R. and Dewitt, B. A., 2014. Elements of Photogrammetry: With Applications in GIS,4th Edition. McGraw-Hill Education (India) Pvt Limited.

GED203 Geodesy 1 (2,1,2)

Definition of Geodesy-Difference between plane and geodetic survey – Figure of the Earth (Topographic – Geoid – Ellipsoid - Sphere) – Geometrical properties of the ellipsoid – Ellipsoidal and spherical excess -Calculating lengths along the meridian and parallel of latitude- Solution of spherical and ellipsoidal triangles - Direct and inverse geodetic problem – Establishing of horizontal and vertical datums - Observation and adjustment of geodetic horizontal control-Trigonometric and precise leveling.

List of References

a- Course Notes

1- Course notes prepared by instructor.

b- Books

1- Hooijberg, M., 2007. Geometrical Geodesy: Using Information and Computer Technology. Springer-verlag, Berlin, Germany.

c- Recommended Books

1- Hooijberg, M., 2011. Practical Geodesy: Using Computers. Springer Ltd, London, UK.

d- Periodical

1- Fes4surveying@wordpress.com

GED204 Adjustment Computations 1 (2,3,0)

Random variables –Measures of tendency and dispersion – Standard deviation and variance - Probability distributions of random variables – Confidence intervals – Testing of Hypothesis – Sources and types of errors in observations – The most probable value – Weights of observations - Correlation among observations – Propagation of random errors – Preliminary detection of blunders – Introduction to the method of Least squares.

List of References

a- Course Notes

1- Course notes prepared by instructor

b- Books

1- Ghilani, C.D. and Wolf, P.R., 2006. Adjustment Computations: Spatial Data Analysis, Fourth Edition. John Wiley & Sons, Inc., USA.

c- Recommended Books

1- Spiegel , M. and Stephens, L., 2011. Schaums Outline of Statistics, Fourth Edition. McGraw-Hill, USA.

GED206 Engineering Economy (2,2,0)

Principles of engineering economy - cost system in engineering institutions and projects - engineering decisions link to the cost-benefit system - the relationship between money and time - cash flow maps and the concept of simple and complex interest - methodologies for evaluating an economically engineering project - Economic trade-off between engineering projects - the completion of the cost of assets and tax calculations for engineering works.

List of References

a- Course Notes

1- Power Point Presentation, Assignments, Self-tests, Prepared by the Instructor

b- Recommended Books

1- Leland Blank, Anthony Tarquin, 2017: "Engineering Economy 7th Edition", McGraw-Hil.

c- Web Sites

1- https://ocw.mit.edu/courses/engineering-systems-division/esd-70j-engineering-economy-module-fall-2009/

GED200 Field Training 1 (0,0,0)

Training period: four weeks with 160 hours of training (8 hours per day x 5 working days×4 weeks) - in which the student performs field training in the summer period outside the college in one of the institutions or companies in the field of specialization (government or private sector) or any place adopted by the department under the supervision of the faculty members. one faculty member for every five students. At the end of the training, the student submits a detailed report and the student performs an oral exam through a test committee.

GED207 Design of Roads, Railways and Tunnels (1,3,0)

Engineering elements controlling the design and planning of roads, bridges, railways, tunnels and their setting out - intersections and transfers - the optimal choice of path - curve design - tunnels and their uses - practical project.

List of References

a- Course Notes

1- Course notes prepared by instructor.

b- Books

1-Highway Design Manual. 6th Ed. California Department of Transportation. 2012.

2- M. J.-P. William-Louis, R. Grégoire in TRANSAERO — A European Initiative on Transportation. 2012

GED209 Geodesy 2 (2,2,2)

Introduction – Celestial sphere – astronomic and geodetic coordinate systems —latitude, longitude, and azimuth determination – zenith determination - Spherical triangles – Napier's rule - Time – Methods to change time and its determination. History of the Egyptian Geodetic network - coordinate systems used in Geodesy – Establishing of local and world best fitting ellipsoid – Gravimetric effect on observations - coordinate transformations – datum shift – Two and three-dimensional Geodesy – adjustment of three-dimensional geodetic networks.

List of References

a- Course Notes

1- PPT prepared by instructor

b- Books

1- Hooijberg, M., 2007. Geometrical Geodesy: Using Information and Computer Technology. Sp verlag, Berlin, Germany.

2- Hooijberg, M., 2011. Practical Geodesy: Using Computers. Springer Ltd, London, UK

3-Hirt, C. and Buerki, B. 2006: Status of geodetic Astronomy at the beginning of 21st Century

4-Surveying and Geodetic Applications: Applications based on extensive field experienc LAMBERT Academic Publishing (August 20, 2018)

5-Hand book of Geodetic astronomyPublished by LAP LAMBERT Academic Publishing (July 28, 2011)

ELE281 Computer Applications 1 (2,1,2)

Object Oriented Programming - Software Modeling- Unified Modeling Language UML-Classes- Files- Exception handling- Graphical User Interface-numerical differentiation and integration-solution of differential equations.

List of References

a- Course Notes

1- Course notes prepared by instructor.

2- Stroustrup, B. (2014). "Lecture:The essence of C++". University of Edinburgh. Retrieved 12 June 2015.

3- Stroustrup, Bjarne (2014). "Computer Applications". Retrieved 5 May 2014.

CIV271 Geotechnical Engineering and Foundation Design (2,2,0)

Soil composition –Definition of weights – Soil particles analysis – water ingredients - Hydraulic soil features – soil pressure – Weight pressure on soil – soil stabilization methods – Sheer force – Earth pressure - Load capacity of huge foundations – Design of shallow and deep foundations.

List of References

a- Course Notes

1- Course notes prepared by instructor.

b- Books

1- Punmia, B.C. 1994 "Soil Mechanics and Foundations", LAXMI Publications PVT. LTD., New Delhi.

2- Egyptian Code of Practice for Soil Mechanics and Foundation Design "ECOP".

MEC 281 Electromechanical Engineering (2,1,0)

Introduction – Application of electrical and mechanical engineering in surveying – Mechanical and Electrical systems - Industrial Materials – Types of machines – Linear motion mechanisms and its application in surveying - Insulation systems – Doors – Motors Control.

List of References

a- Course Notes

1- Course notes prepared by instructor.

b- Books

1- MahmoodNahvi, 2003 "Electric Circuits", 4th edition, Schaum's Outlines, Joseph A. Edminister, McGraw Hill.

2- Richard C. Dorf, and James A. Svoboda, 2011: "Introduction to Electric Circuits", 8th Edition, Wiley.

c- Recommended Books

1- Allan Robbins and Wilhelm miller, 2007: "Circuit Analysis: Theory and practice", 4th E

2-Jhon Bird, 2001: "Electrical Theory and Technology", Newnes, Elsevier, Oxford.

GED301 Photogrammetry 2 (2,1,2)

Refinement of Measured Image Coordinates – Coordinate Transformation – 2D Coordinate Transformation Models – 3D Coordinate Similarity Transformation – Collinearity Condition

Equations – Coplanarity Condition Equation – Space Resection – Space Intersection – Analytical Inner, Relative and Absolute Orientation – Analytical Aerial Triangulation – Analytical rectification - Direct Linear Transformation (DLT)..

List of References

a- Course Notes

1- Course notes prepared by instructor.

b- Books

1- Edward Mikhail, 2001, Introduction to modern photogrammetry, 1st Edition.Wiley, USA

2- Wang Zhizhano., 2000. Principal of photogrammetry. Press of Wuhan Technical and Mapping, Beijing

c- Recommended Books

1- Manual of photogrammetry,2013, 6th Edition American Society of Photogrammetry and

2- Wang Zhizhano., 2000. Principal of photogrammetry.Press of Wuhan Technical Universi

GED303 Adjustment Computations 2 (2,2,0)

Basics of theory of adjustment and analysis of observations — weights - Adjustment using the method of Least squares – Parametric L-S adjustment - conditional L-S adjustment - General L-S adjustment – Adjustment of leveling nets - Adjustment of traverses and horizontal geodetic networks – Accuracy computation of adjustment results – Analysis of results and blunder detection – Introduction to adjustment of dynamic models.

List of References

a- Course Notes

1- Course notes prepared by instructor.

b- Books

1- Ghilani, C.D. and Wolf, P.R., 2006. Adjustment Computations: Spatial Data Analysis, Fourth Edition. John Wiley & Sons, Inc., USA.

GED304 Geographic Information Systems 1 (2,2,2)

Introduction and definitions – History and development of GIS – Technology of GIS and its relationship with Surveying – Data elements of GIS – Spatial data Sources – Error sources in Spatial data – Different forms of spatial data and processing techniques – Devices used to form digital spatial data – Metadata in GIS – Most important forms of metadata – Definitions and basics of relational database – statements and orders of SQL(Structured Query Language) –Principles of Normalization.

List of References

a- Course Notes

1- Lecture: Power Point Presentation, Assignments, Self-tests, Prepared by the Instructor.

b- Recommended Books

1- 1- Francis Harvey., 2015. A primer of GIS: fundamentals and cartographic concepts, 2nd edition. Th Guilford Press, USA.

2- 2- John Stillwell and Graham Clarke., 2009. Applied GIS and Spatial Analysis. Wiley, USA.

c- Web Sites

1- www.itep-edu.org

CIV371 Design of Concrete Structures (2,2,0)

Use of Concrete – Sections- Design of simple and continuous beams- Design of columns – Design of some types of slabs – Formation of concrete skeletons and trusses – Bridges – Tunnels.

List of References

a- Course Notes

1- Lecture notes and handouts prepared by instructor

b- Books

1- Egyptian code of practice and design of RC structures

2- Egyptian code for design aids for RC structures

3- Egyptian code for standard reinforcement detailing

c- Recommended Books

1- M. Ghoneim, 2013, Design of reinforced concrete structures, V1.

d- Web Sites

1- ACI structural journal, American concrete institute.

2- ACI material journal, American concrete institute.

3- Journal of structural engineering, ASCE American society of civil engineers.

GED302 Map Projection and Cartography (2,1,1)

The general principals of map projection - The theory of distortion – Projection (cylindrical-conical-plane) - traditional and non-geometric projections - relation between different projections - choice of appropriate projection surface - Transverse Mercator - Use of Mercator projection for the Egyptian maps. Introduction to cartography - Vision and Perception - Map Design - Terrain Representation – Special purpose Maps - Printing Names in Maps - Rules for the preparation, production and revision of maps - computer mapping - circulation of digital maps on smart devices - color theory - map conversion from Paper-to-digital

List of References

a- Course Notes

1- Course notes prepared by instructor.

b- Books

1- Margaret M. Maher., 2013. Lining Up Data in ArcGIS: A Guide to Map Projections, 2nd Editio

2- ODT Inc., 2002. The Hobo-Dyer equal area projection: world map. ODT, Inc.

3- Arthur H. Robinson, Joel L. Morrison, Phillip C. Muehrcke, A. Jon Kimerling a "Elements of Cartography", John Wiley & Sons Inc
4- JuilanaO.Muehrcke, 2009 : "Map use: Reading and analysis.

c- Web Sites

1- fes4surveying@wordpress.com

GED306 Remote Sensing 1 (2,2,2)

The electromagnetic spectrum – Reflection, scattering and absorption - Sensors and platforms - Passive and active sensors - Sensors properties – Various types of resolution – Spectral signature – Panchromatic and multi-spectral images – Remote sensing satellites. Image processing – Radiometric enhancement – Spatial enhancement – Spectral enhancement - Referencing and registration – Image rectification – Image merging – Image classification – Supervised classification – Unsupervised classification – Radar remote sensing – Applications of remote sensing.

List of References

a- Course Notes

1- Course notes prepared by instructor.

b- Books

1- Lillesand, T.M., Kiefer, R.W. and Chipman, J.W., 2008. Remote Sensing and Image Interpretation. Sixth Edition, John Willey & Sons, Inc.
2- Schowengerdt, R.A., 2006. Remote Sensing: Models and Methods for Image Processing. Third Edition, Elsevier Inc., USA.
3- John A. Richards and Xiuping Jia, 2006. Remote sensing digital image analysis, Springer, Germany.
4- Chen, C. H., 2008, Image processing for remote sensing .Taylor & Francis Group, LLC., USA.

c- Web Sites

1- www.Imagery-Central.com
2- www.spotimage.fr/html
3- www.fes4surveying.wordpress.com

GED307 Computer Applications 2 (2,1,1)

Use and development of application software in Geomatics engineering fields such as: Terrestrial and aerial Surveying, digital maps, Geodesy, Photogrammetry, Remote Sensing and Spatial Information Systems.

List of References

a- Books

1- Ahlersten, K. 2012. Introduction to Matlab, bookboon.com.

b- Recommended Books

1- Mathworks, 2005. MATLAB: The Language of Technical Computing, The Mathworks.

2- Conzalez, R., Woods, R. and Eddins, S. 2004.Digital Image Processing using Matlab. Pearson Prentice Hall, New Jersey.

GED308 Geodesy 3 (2,1,2)

Basic principles of satellite geodesy and satellite orbit- Different geodetic satellite missions- Kepler laws – Satellite orbital parameters – Global Navigation Satellite System (GNSS) - GPS methodology - static and kinematic observational techniques- Relative and absolute point positioning – IGS stations - PPP technique - Introduction to inertial Navigation System (INS). Methods of monitoring crustal movements.

List of References

a- Course Notes

1- Course notes prepared by instructor.

b- Books

1-Guochang Xu, 2007. GPS Theory, Algorithms and Applications, 2nd edition, Springer, Germany.

2- Hofmann-Wellenhof, B., Lichtenegger, H. and Collins, J., 2003. GPS Theory and Practice. Springer-Verlag, UK.

c- Recommended Books

1-Günter Seeber, 2003. Satellite Geodesy, 2nd edition, Walter de Gruyter, Berlin.

GED300 Field Training 2 (0,0,0)

Training period: four weeks with 160 hours of training (8 hours per day x 5 working days×4 weeks) - in which the student performs field training in the summer period outside the college in one of the institutions or companies in the field of specialization (government or private sector) or any place adopted by the department under the supervision of the faculty members, one faculty member for every five students. At the end of the training, the student submits a detailed report and the student performs an oral exam through a test committee.

GED402 Geographic Information Systems 2 (2,1,2)

Object Oriented Database - Various Applications of Geographic Information Systems (MIS-LIS) - Theory of Shape Representation and Applications - Specifications and Requirements of Spatial Information Systems - How to Form an Effective Spatial Information System - Diverse Applications of Information Systems – Chart theory - various models of spatial data representation - processing of spatial and descriptive big data - application.

List of References

a- Course Notes

1- Course notes prepared by instructor.

b- Books

1- Verbyla, D.L., 2002. Practical GIS Analysis, CRC Press,India.
2-Gilbert Laporte, Stefan Nickel, Francisco Saldanha da Gama, 2015, Location Science, Sp

c- Recommended Books

1- Allan Brimicombe.,2010. GIS environmental modeling and engineering. Taylor anc Francis Group, LLC,USA.

GED403 Physical Geodesy (2,2,0)

Fundamentals of Potential theory (attraction, potential, Gauss and Green's Integral Formulas, harmonic functions). Gravity field of the earth (definition - source - units) - Relation between physical geodesy and other surveying sciences -potential of earth in terms of spherical harmonics-Stock's formula. Absolute and relative gravity measurements - Normal gravity and actual gravity - Gravity anomalies (computation, uses) - Gravimetric geoid computation - Satellite missions for gravity field determination - Height systems - Interpolation methods.

List of References

a. Course Notes

1- Course notes prepared by instructor.

b. Books and papers

1- Hofmann-Wellenhof, B. and Moritz, H., 2006. Physical Geodesy. Second Edition, Springer Wien, New York.
2- Erker E, H¨oggerl N, Imrek E, Hofmann-Wellenhof B, K¨uhtreiber N, 2003. The Austrian geoid – recent steps to a new solution. Osterreichische Zeitschrift ¨ f¨ur Vermessung & Geoinformation.
3- Arfa-Kaboodvand K, Groten E, Varga P, Závoti J, 2001. International Earth Rotation Service, 28, 15–25.

c. Web Sites

1- Fes4surveying@wordpress.com

GED404 Digital Image Processing (2,2,1)

An introduction – Formation of digital images – Techniques of Digital image acquisition – Fourier transform - Image enhancement and restoration – Image registration - Image segmentation – Extraction of features from digital images.

List of References

GED405 Remote Sensing 2 (2,1,2)

a. Course Notes

1- Course notes prepared by instructor.

b. Books and papers

1- Rafael Gonzalez, Richard Woods, 2018. Digital Image Processing 4th Edition. Pearson India.

2- Rafael Gonzalez, Richard Woods,Eddins 2020. Digital Image Processing Using MATLAB 3rd edition. Gatesmark.

c. Web Sites

2- https://sisu.ut.ee/imageprocessing/book/1

Introduction to the formation of radar images - Electromagnetic polar wave theory - Polar dispersion of radar waves from targets - Various applications of radar images - Detection of change using radar images - classification of radar images - Analysis of radar images – Theory of Lidar – Terrestrial and airborne Lidar – Formation and processing of 3-D point cloud – Generation of 3-D digital models – fusion of digital images and 3-D surface models – Feature extraction from fused images.

List of References

a- Course Notes

1- Course notes prepared by instructor.

b- Books

1- Mikhail, E. M., Bethel, J. S. and McGlone, J. C.2001,. Introduction to modern photogrammetry. John Wiley & Sons, Inc., USA.

2- Wolf, P. R. and Dewitt, B. A., 2000. Elements of Photogrammetry: With Applications in GIS. McGraw-Hill Education (India) PvtLimited.

3- Schenk, T., 1999. Digital Photogrammetry. Terra Science LLC, USA

c- Web Sites

1- www.Imagery-Central.com

2- www.spotimage.fr/html

3- www.fes4surveying.wordpress.com

GED406 Photogrammetry 3 (2,2,2)

Introduction to digital photogrammetry - Digital images – satellite images - Image coordinate measurement and transformation – Mathematical models dealing with satellite images. Moving window operations – Edge detection - feature extraction – Image matching – Image matching methods – Automatic image orientation – Automatic triangulation – Automatic generation of DTM – Generation of digital orthophotos.

List of References

a- Course Notes

1- Course notes prepared by instructor.

b- Books

1- Mikhail, E. M., Bethel, J. S. and McGlone, J. C.2001,. Introduction to modern photogrammetry. John Wiley & Sons, Inc., USA.

2- Wolf, P. R. and Dewitt, B. A., 2000. Elements of Photogrammetry: With Applications in GIS. McGraw-Hill Education (India) PvtLimited.

c- Recommended Books

1- Schenk, T., 1999. Digital Photogrammetry. Terra Science LLC, USA.

d- Web Sites

1- www.isprs.org

GED408 Computer Applications 3 (2,1,1)

Software of aerial and space image analysis - Software of Lidar image analysis – Web programming languages – Spatial Software for Web – Spatial Software for Smart phone.

List of References

a- Books

1- Ahlersten, K. 2012. Introduction to Matlab, bookboon.com

2- Conzalez, R., Woods, R. and Eddins, S. 2004. Digital Image Processing using Matlab. Pearson Prentice Hall, New Jersey.

b- Recommended Books

1- Mathworks, 2005. MATLAB: The Language of Technical Computing, The Mathworks.

GED410 Study and Management of Engineering Projects (2,2,0)

Planning, organizing and managing of projects – PERT network using critical path - project feasibility – risk management – project team – project monitoring – writing review reports and execution reports – finalizing project and evaluation.

List of References

a- Course Notes

1- Course notes prepared by instructor.

b- Books

1- W.P. Nel., 2007. Management for Engineers, Technologists and Scientists, 2nd edit

2- João M. Fernandes, Ricardo J. Machado, 2016, Requirements in Engineering Projec Christoph Schwindt, Jürgen Zimmermann,2015, Handbook on Project Managemen Publishing.

c- Periodical

1- Resource management.

d- Web Sites

1- http://www.iso.org/

GED490 Project (0,0,5)

The project adopts the compilation of the student on the whole of the skills required by the labor market in addition to a part that represents his own creativity and includes different styles. The project begins by dividing students into teams and submitting a proposal for the project and then the teams begin to calibrate the devices - create control points, monitor and adjust them – precise levelling - practical training for the hydrographic surveying on selected sites - work application on spatial information systems and other survey works- Make a regular scientific report on the spatial work that is carried out. - Presentation and discussion at the end of the project term. The duration of the project is three field weeks and three calculation weeks. Students are divided into groups of no more than five students per group and supervised by two faculty members (or a faculty member and one of the assistants) with 30 hours of supervision per week each, which is considered as extra work on the basis that the project is an innovative work carried out in various areas outside the college and requires continuous presence on-site for students and supervisors.

List of References

c- Recommended Books

1. CharlesD. Ghilani and PaulR. Wolf., 2012.Elementary Surveying (An Introduction to Geomatics), Thirteenth Edition.Pearson Education, Inc., New Jersey.
2. Paul Gay, 2015, Practical Boundary Surveying, Springer International Publishing.

Elective courses

GED331 Close Rang Photogrammetry (2,0,2)

Terrestrial cameras - Geometrical properties of close-range photos – Ground Control - Mathematical models – Solution by Direct Linear transformation DLT model - X-ray Photogrammetry- Digital close-range Photogrammetry – Applications of close-range photogrammetry – Principles of Hologrammetry.

List of References

a- Course Notes

1- Course notes prepared by instructor.

b- Recommended Books

1- Thomas Luhman and Stuart Robson.,2011:. Close Range Photogrammetry: Principles, Techniques and Applications. Whittles Publishing, UK.
2- Thomas Luhman and Stuart Robson., 2013: Close-Range Photogrammetry and 3D Imaging,2 edition

.De Gruyter, Berlin.

GED332 Adjustment and Maintenance of Instruments (2,0,2

Different theories for land surveying and photogrammetry instruments – Detection of instrumental errors – Adjustment and calibration of instruments – The effect of instrumental errors on observations – Observational errors, their analysis and their refinement.

List of References

a- Books

1- Duggal, S.K., 2004. Surveying. Vol.1. McGraw-Hill, USA.

b- Recommended Books

1- Manual of Photogrammetry, 6th edition; 2013.

GED409 Hydrographic Surveying (2,0,2)

Introduction - Uses hydrographic survey - - hydrographic operations associated with marine area – Shore surveying – Methods and instruments used for measuring Depth - tides - tables used for tide - Calculating the coordinates of a point inside the water - methods of measuring the speed and direction of water currents - elements of current movement - identification the shore boundary line – vertical datum in hydrographic survey.

List of References

a- Course Notes

1- Power Point Presentation and video prepared by instructor.

b- Books

1- Ghilani, C. D. and Wolf P.R., 2012. Elementary Surveying. Pearson Education, Inc., New Jersey, USA.

2- NIOHC / RSAHC Technical Workshop, 2007, Jeddah, KSA.

.

c- Recommended Books

1- A.E Ingham., 2002. Hydrography for the surveyor and Engineer, 3rd edition. Wile

d- Web Sites

1- www.usace.army.mil/inet/usace-does/eng-manuals/em1110-2-1003/c-8.pdf , www.solent.ac.uk/hydrography

CIV372 Transportation Planning and Traffic Engineering (2,0,2)

Elements of transport planning – Different divisions of the transport system – Definition of the problem, goal and objectives – Data collection – Trip generation and trip distribution – Trip distribution on different means of transport – Transport networks planning and trip allocation – Evaluation and adjustment of transport projects – Introduction to traffic engineering – Characteristics of traffic elements – Study of traffic volumes – Characteristics of traffic flow– Study of trip duration and speed- waiting studies - Intersections.

List of References

a- Books

1- Jon D. Fricker.,2004. "Fundamentals of Transportation Engineering, a multimodal system approach", pearson, prentice hall, USA.

b- Web Sites

1- WWW.ASCE.com
2- WWW.TRB.com

GED431 Surveying Engineering Applications (2,0,2)

Principles of surveying applications – Applications on horizontal and vertical movements and deformations of industrial works – Surveying registration of Antiquities – Setting out civil works – Keeping track of engineering projects – Surveying and mapping data Bank – Applications of Geodesy in aerial transportation.

List of References

a- Course Notes

1- Course notes prepared by instructor.

b- Books

1- Stephen V. E., 2009.A guide to understanding land surveys,3rd edition. John Wiley & sons, Inc., USA.

c- Recommended Books

1- W. Schofield and M. Breach, 2007.Engineering Surveying,6th Edition, Elsevier Ltc
2- Paul Gay ,2015, Practical Boundary Surveying, Springer International Publishing

GED432 Digital Terrain models (2,0,2)

Concept of digital terrain model (DTM) – Different methods of data collection to generate DTM - Applications of DTM - Different techniques of generating a digital data base – Mathematical models required for digital terrain generation - Automatic methods needed for generating DTM – Methods of assessing the quality of DTM – Some application software used for DTM generation. Use of DTM in volume computation and planning sewage networks.

List of References

a- Course Notes

1- Course notes prepared by instructor.

b- Books

1- Li, Z., Zhu, C. and Gold, C., 2010. Digital Terrain Modeling: Principles and Methodology. Taylor & Francis, UK.

2- Dr. Robert Joseph Peckham, Dr. Gyozo Jordan, 2007, Digital Terrain Modelling, Springer Berlin Heidelberg

c- Recommended Books

1- Chandra, A.M., 2005. Surveying Problem Solution With Theory And Objective Type Questions. New age international, India.

GED433 Spatial Data analysis (2,0,2)

Spatial data quality - Concept of spatial data quality - Quality Components, Standards and Metadata - Vector and Raster data quality - how to evaluate the quality of vector or raster data - how to describe the quality of vector or raster data - how to enhance this quality; how to evaluate it; and how to relate it with the decision-making process - Spatial Integrity Constraints: Tools of Improving the Internal Quality of Spatial Data - Spatial Data Quality Assessment and Documentation - Key theory for minimizing the risks of data misuse in a specific decision-making context.

List of References

a- Course Notes

1- Course notes prepared by instructor.

b- Books

1- Robert Haining, 2003. Spatial Data Analysis: Theory and Practice. Taylor & Francis, Cambridge University Press.

2- Christopher Lloyd, 2010. Spatial Data Analysis: An Introduction for GIS users, 2007, Spatial Data Analysis: An Introduction for GIS users, Oxford University Press

c- Web Sites

1- https://www.esri.com/arcgis-blog/products/product/analytics/how-to-perform-spatial-analysis/

CIV471 Utilities Planning (2,0,2)

Principles of planning – Types of utilities - Drinking water – Sanitary Drainage – Electricity – Gas – Telephones – Populations studies – Utilities maps – Calculations of utility capacities – Future planning of regions and its impact on utilities planning.

List of References

a- Course Notes

1- lecture notes prepared by the instructors

b- Books

Frank Spellman., 2003. Handbook of water and wastewater treatment plant operations. Lewis Publishers. Florida, USA.

c- Recommended Books

1- Metcalf & Eddy, 2013. Wastewater Engineering Treatment and Reuse, 5th edition. McGraw-Hill International Editions.

2- Nicholas Cheremisinoff, 2002. Handbook of Water and Wastewater Treatment Technologies. Butterworth-Heinemann, UK.

d- Periodical

1- American Society of civil engineering

e- Web Sites

1- www.sciencedirect.com

TECHNICAL LANGUAGES ELECTIVE COURSES

GEN0X0 Technical Language (2,0,0)

Characteristics of the English or French or German technical language, grammar review, effective sentences and their characteristics, identify some common mistakes in the writing of technical sentence, paragraph construction, types of paragraphs, development of communication skills by reading and analysis of excerpts from technical writing in various engineering disciplines such as mechanical, electrical , civil ... etc.

References:

1- Mark Hancock & Annie McDonald, English Result - Intermediate Level, Oxford University press, Last Edition .
2- Durrell, Martin, “ Using German : a guide to contemporary usage / Martin Durrell”, Cambridge, U.K. ; New York : Cambridge University Press, 2003.
3- Coffman Crocker, Mary E, “ Schaum's outline of French grammar”, McGraw-Hil, Schaum's outline series, 1999, 4th ed.

UNIVERSITY REQUIREMENTS

GEN011 Computer Skills (1,0,1)

IT concepts and terminology, Computer hardware, operating systems, Computer networks, Internet, Computer graphics, Multimedia systems, Databases. Practical applications: Operating system (Microsoft Windows), Word processing (Microsoft Word), Spreadsheets (Microsoft Excel), Microsoft PowerPoint, Databases (Microsoft Access). Introduction to programming concepts, programming languages and their classification, logical design of programs and algorithms, structural programming and object-oriented programming.

References:

1- Practice using ICDL components

GEN012 History of Engineering & Technology (2,0,0)

The definition of science, technology, engineering and architecture. The development of civilizations and their relationship to human sciences (ancient Egyptian civilization, Roman and Greek civilization, Mesopotamia, dark ages, industrial revolution). Different engineering disciplines and their role in society. The historical relationship between science and technology. The relationship between the development of engineering, the social and economic development of the environment, the challenges of globalization and the new economy. The contribution of engineers in the new millennium, the issues of economic and industrial development in Egypt.

References:

1- James E. McClellan & Harold Dorn, Science and Technology in World History: An Introduction, The Johns Hopkins University Press, 2nd. Ed., 2006.
2- Richard Shelton Kirby, Engineering in History, Dover publications, 1990.

GEN900 Communication & Presentation Skills (1,1,0)

General introduction to communication, the importance of communication, types of communication, communication barriers, listening skills, attributes and methods of reading, verbal communication: speaking and writing skills, non-verbal communication, dialogue skills and strategies of persuasion, communication in the work environment, writing CVs, reports and official letters.

References:

1- Gary Johns and Alan M. Saks, Organizational Behavior, Addison Wesley Longman, 2009.
2- Scgermerhorn, Jr., R. J., Hunt, G. J., and Osborn, N. R., Organizational Behavior, John Wiley & Sons, Inc., New York, 10th. Ed., 2008.

GEN902 Human Rights and Combating Corruption (1,1,0)

Human rights: general introduction, definition of human rights, characteristics and principles of human rights, general rules of the idea of human rights, historical development of the idea of human rights, types of human rights, individual rights, collective rights (people's rights), sources of human rights, legal system of rules of protection Human rights, human rights according to the Egyptian constitution in 2014, the duties and obligations of individuals in society. Combating corruption: definition of corruption, its causes, effects and characteristics, types of corruption and its causes, the impact of corruption on human rights and development, the impact of corruption on economic rights and sustainable development, criminal confrontation of corruption.

References:

1- Peter Joseph , The New Human Rights Movement: Reinventing the Economy to End Oppression, Inc. Blackstone Audio: Books, 2017

GEN903 Research and Analysis Skills (1,1,0)

Scientific thinking and its characteristics, definition of scientific research and its characteristics, steps of scientific research (selection of the subject of research, determine the problem of research and selection factors, determine the framework of research, determine the method of research, data analysis), types of scientific studies: exploratory studies, descriptive studies, experimental studies . Methods of scientific research: descriptive approach, social survey, content study, content analysis. Data collection tools: Metrics, observation, interview, questionnaire. Data presentation and analysis methods: Descriptive methods, deductive methods.

References:

1- Gary Johns and Alan M. Saks, Organizational Behavior, Addison Wesley Longman, 2009.
2- Scgermerhorn, Jr., R. J., Hunt, G. J., and Osborn, N. R., Organizational Behavior, John Wiley & Sons, Inc., New York, 10th. Ed., 2008.

GEN905 Professional Ethics (1,1,0)

The course provides the background needed to discuss the core topics of engineering ethics, with a focus on the ethical issues facing engineers in the areas of engineering work in companies. The course includes the definition of the general elements of the ethics of the profession and the observance of the public interest and regulations and regulations, obligations to the community, the responsibilities of engineers, disclosure of violations, behavior, basic principles and codes of the ABET code of conduct of engineers.

References:

1- William Frey, Professinnal Ethics in Engineering, November, 2013, http://cnx.org/content/col10399/1.4/

GEN906 Critical Thinking (1,1,0)

Theoretical concepts (memory, thinking, creativity), an introduction to the thinking skills, the nature of thinking (definition, characteristics, levels), types of thinking (creative, critical, scientific), cognitive thinking skills, meta-cognitive thinking skills, thinking measurement tools, strategies Used in the development of thinking skills, programs to teach thinking skills, methods of teaching thinking skills.

References:

1- Critical Thinking: A Beginner's Guide to Critical Thinking, Better Decision Making and Problem Solving Paperback, by Jennifer Wilson,, Create Space Independent Publishing Platform 2017.

GEN907 Human Resources Management (1,1,0)

Historical development of human resources management, key functions of human resources management, human resources planning, access to human resources, training and development of human resources, compensation of human resources, human resource conservation.

References:

1- Human Resource Management, University of Minnesota Libraries Publishing, 2016

GEN908 Contracts and Legislation (1,1,0)

The course aims to provide the student with the technical and legislative knowledge related to the practice of the profession. The study of building legislation, urban planning and the laws governing the practice of the profession and the work systems (engineer / owner / contractor / ...) at the local and international levels as well as studying the methods of contracting/rules and systems for the preparation of integrated implementation documents. Tenders and methods of their examination and evaluation.

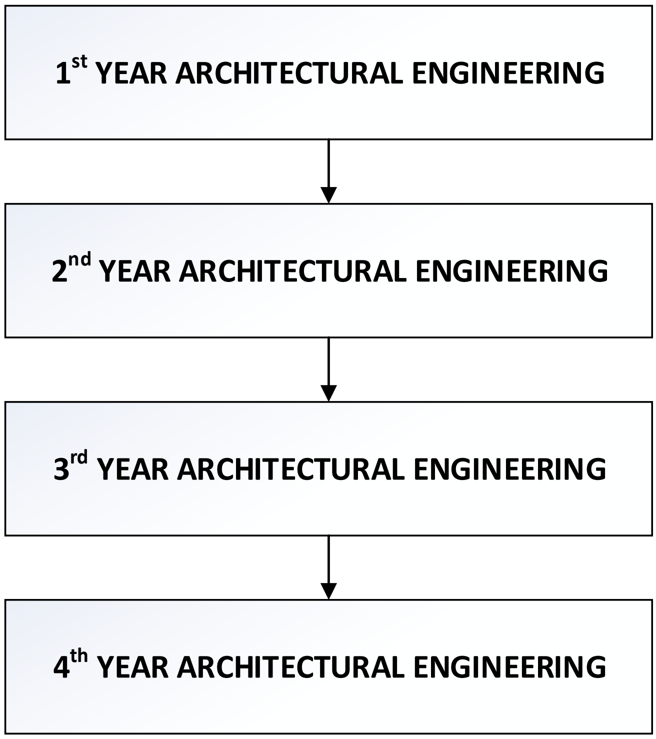
References:

1- Randall S. Schuler, Susan E. Jackson, Strategic Human Resoure Management , Wiley, 2nd ed., 2007.
2- Lewicki, J. R., Saunders, M. D., and Barry, B., Essentials of Negotiation, McGraw - Hill, 5th. Ed., 2011.

ARCHITECTURAL ENGINEERING DEPARTMENT PROGRAM

ARCHITECTURAL ENGINEERING DEPERTMENT
UNDERGRADUATE PROGRAM

Architectural Engineering Department has only one Academic Program under the name "Architectural Engineering" the chart below illustrates the Plan of the Department as follows:-



ARCHITECTURAL ENGINEERING PROGRAM

Program Information

1. **Faculty Vision:**

   The Faculty of Engineering at Shoubra, Benha University, aspires to be a pioneering college at the national, regional, and international levels in the fields of engineering education, scientific research, innovation and entrepreneurship in order to achieve the goals of sustainable development.

2. **Faculty Mission**

   The Faculty of Engineering at Shoubra, Benha University, is committed to prepare a graduate with competencies and problem-solving skills[1] that qualify each engineer to compete in regional and international labor markets[2], the graduate will be able to innovate and become an entrepreneur[3], the faculty is also committed to the development of engineering sciences[4] and producing internationally distinguished scientific research[5], within the framework of human values and social responsibility[6].

3. **Program Vision**

   The Architectural Engineering Program, Faculty of Engineering at Shoubra, aspires to be a pioneering program among the academic communities in the field of architectural education and distinguished in scientific research at the regional and international levels, and to provide a promising community service to enhance the quality of life.

4. **Program Mission**

   The Architectural Engineering Program, Faculty of Engineering in Shubra, is committed to provide a distinguished educational service for graduating a competent architect equipped with the capabilities, knowledge and mental, scientific, research, technical, professional and behavioral skills that qualify him to practice the profession of architecture at a professional level, to compete in the labor market locally and regionally, to provide distinguished services to society, and to promote The profession of architecture, within the framework of human and moral values.

To judge the compatibility between the program mission and faculty mission, the following matrix is used.

Faculty Mission / Program Mission	prepare a graduate with competencies and problem-solving skills [1]	compete in local and regional labor markets [2]	innovate and become an entrepreneur [3]	development of engineering sciences [4]	producing internationally distinguished scientific research [5]	human values and social responsibility [6].
Provide an outstanding educational service	√		√			
Prepare a skilled architect equipped with knowledge and skills	√	√			√	√
Compete in the labor market locally and regionally		√		√	√	
Provide superior services to the community		√	√			
Upgrade the profession of architecture		√	√	√		
Commitment to human and moral values						√

5. Program Aims

1. Provide students with modern theoretical and applied sciences related to architecture as well as engineering and human sciences, related to it and compatible with both society needs and market in a manner ensuring continuous self-learning and fulfills the requirements of sustainability.
2. Graduate a competent architect who has the necessary scientific understanding and knowledge of the specialization requirements. In addition to supporting his ability to adhere to the ethics and traditions of the profession honestly.
3. Expanding students' vision, training, and developing their abilities and skills in all fields related to architecture.
4. Support students' ability to follow the scientific approach in solving problems by defining the problem and collecting the necessary information about it, classifying it, analyzing it and developing appropriate solutions for it, to produce architectural, urban and planning design projects with the required efficiency and quality, using advanced technologies and tools.

5. Provide students with the necessary practical experiences in the field of design through training them on projects similar to reality with different limitations and considerations, whether economic, environmental, social, political, security or ethical, and developing their capabilities to participate in an integrated and effective way with work teams to propose different alternatives to the solution and evaluate them to choose The most suitable ones, preparing the necessary documents and fees, and supervising their implementation.

To judge the compatibility of program mission with its objectives, the following matrix is used:

Program objectives / Program Mission	Objective #1	Objective #2	Objective #3	Objective #4	Objective #5
Providing a distinct educational service	√		√		√
Graduating a competent architect equipped with knowledge and skills	√	√		√	
Competing in the labor market, locally and regionally		√	√		√
Providing distinguished services to the community		√			√
Upgrading the profession of Architecture		√	√	√	
Commitment to human and moral values	√		√		√

6. Graduate Attributes

1) A graduate who are Familiar with knowledge, theoretical sciences, applied sciences, engineering, humanities and social sciences related to architecture and urban design that qualifies graduates to practice the profession of architecture and be compatible with both the needs of society and the labor market.

2) A graduate who are familiar with continuous self-learning, developing skills, and keeping pace with developments in the field of specialization to generate innovative ideas and achieve sustainability requirements.

3) A graduate who can use the scientific method in monitoring, identifying, and analyzing architectural and urban problems by defining the problem and collecting the necessary information, classifying, analyzing, and developing appropriate solutions for facing problems and produce architectural, urban, and planning design projects with due efficiency and quality.

4) A graduate who can use modern technology techniques in all areas of specialization related to buildings, coordination with constructional and electromechanical disciplines, and the ability to use advanced digital tools in the design and implementation of buildings and virtual simulation to evaluate and produce innovative designs that achieve efficient performance considering the surrounding environmental and urban influences.

5) A graduate who can communicate effectively with presentation, discussion, and persuasion with work teams to suggest various alternatives to the solution and evaluate them to choose the most suitable one.

6) A graduate who has ethics of the profession and has honest of competition with others. He has the scientific understanding and knowledge necessary for the requirements of the architectural specialization.

7) A graduate who can coordinate with all other disciplines. He can work with and lead a team of different engineering disciplines during the design and implementation phase. He also can manage human resources from workers and technicians.

8) A graduate who are familiarity with architectural and urban codes, laws, and requirements, and he can apply them to match local needs and aspirations to keep pace with global developments.

7. Program Competencies

According to the National Academic Reference Standard, the program in Architectural Engineering must satisfy the following Competencies:

1- General Engineering NARS Competencies in 2018		
Level A (NARS)	A.1	Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.
	A.2	Develop and conduct appropriate experimentation and/or simulation, analyze and interpret data, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.
	A.3	Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic,

Level A (NARS)		environmental, ethical and other aspects as appropriate to the discipline and within the principles and contexts of sustainable design and development.
	A.4	Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.
	A.5	Practice research techniques and methods of investigation as an inherent part of learning.
	A.6	Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.
	A.7	Function efficiently as an individual and as a member of multi-disciplinary and multi-cultural teams.
	A.8	Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.
	A.9	Use creative, innovative, and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.
	A.10	Acquire and apply new knowledge; and practice self, lifelong and other learning strategies.

2- Architecture NARS		
Level B (NARS)	B.1	Create architectural, urban, and planning designs that satisfy both aesthetic and technical requirements, using adequate knowledge of history and theory, related fine arts, local culture and heritage, technologies, and human sciences.
	B.2	Produce designs that meet building users' requirements through understanding the relationship between people and buildings, and between buildings and their environment; and the need to relate buildings and the spaces between them to human needs and scale.
	B.3	Generate ecologically responsible, environmental conservation and rehabilitation designs; through understanding of structural design, construction, technology, and engineering problems associated with building designs.
	B.4	Transform design concepts into buildings and integrate plans into overall planning within the constraints of project financing, project management, cost control and methods of project delivery; while having adequate knowledge of industries, organizations, regulations, and procedures involved.

	B.5	Prepare design project briefs and documents and understand the context of the architect in the construction industry, including the architect's role in the processes of bidding, procurement of architectural services and building production.
	B.6	Be able to utilize technology as a tool in a wide range of documentation, presentation, analysis applications, visualization, simulation of building performance and form generation, using CAD, BIM Parametric & Generative design software in Interior Design, Architecture Design, urban design, and urban planning.
	B.7	Demonstrate ability to recognize and manipulate the interplay between form, function, structure, and materials in 3D spaces

To judge the compatibility of program objectives with its competencies, the following matrix is used:

Program Objectives	**Program Competencies**																
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	B6	B7
Objective #1	√		√			√	√			√							
Objective #2	√				√	√					√	√	√				√
Objective #3			√			√		√	√		√			√		√	
Objective #4	√				√			√	√	√			√	√	√	√	√
Objective #5		√		√					√			√		√	√	√	√

PROGRAM REQUIREMENTS

ARCHITECTURAL ENGINEERING PROGRAM REQUIREMENTS

The following Tables list the subjects, its classification and compare them with the requirements of the reference framework for the two-semester system undergraduate programs issued by the committee of engineering, technological and industrial studies sector at the Supreme Council of the Egyptian Universities in 2020.

#	Requirements	% according to reference framework	Contact Hours	Achieved percentage %
1	Humanities & Social Science	8-12	20	8
2	Mathematics & Basic Sciences	26-20	50	20
3	Basic Engineering Science	25-30	73	29.2
4	Applied Engineering and Design	25-30	73	29.2
5	Business Management	2-4	9	3.6
6	Engineering Knowledge	3-6	15	6
7	Project & Field Training	3-6	10	4
		100	250	100

#	Subjects	Min. Percentage according to reference framework (%)	Contact Hours	Achieved percentage %
1	University Requirements	8	20	8
2	Faculty Requirements	20	70	28
3	Major Specialization Subjects	35	96	38.4
4	Minor Specialization Subjects	Maximum 30	64	25.6
			250	100

LIST OF COURSES
ARCHITECTURAL ENGINEERING PROGRAM

No.	Code	Course	Contact Hrs				Credit Hours
			Lec.	Tut.	Lab.	Total	
University Requirements (12+7+1 = 20 Contact Hours)							
1	GEN0x0	Elective - Language requirements List	2	0	0	2	2
2	GEN011	Computer Skills	1	0	1	2	1
3	GEN012	History of Engineering & Technology	2	0	0	2	2
4	GEN90x	Elective - University Requirements list	1	1	0	2	1
5	GEN90x	Elective - University Requirements list	1	1	0	2	1
6	GEN90x	Elective - University Requirements list	1	1	0	2	1
7	GEN90x	Elective - University Requirements list	1	1	0	2	1
8	GEN90x	Elective - University Requirements list	1	1	0	2	1
9	GEN90x	Elective - University Requirements list	1	1	0	2	1
10	GEN90x	Elective - University Requirements list	1	1	0	2	1
Faculty Requirements (23+30+17 = 70 Contact Hours)							
1	BAS010	Differential Calculus and Algebra	2	2	0	4	3
2	BAS011	Statics	2	1	2	5	3
3	BAS012	Engineering Chemistry	2	1	2	5	3
4	BAS013	Physics of Materials & Electricity	2	1	3	6	3
5	BAS014	Integral Calculus & Analytical Geometry	2	2	0	4	3
6	BAS015	Dynamics	2	1	2	5	3
7	BAS016	Physics of Light, Heat and Magnetism	2	1	2	5	3
8	BAS213	Statistics and Probabilities	2	2	0	4	3
9	MEC011	Production Technology & workshops	1	0	2	3	2
10	MEC010	Engineering Drawing (1)	0	3	0	3	1
11	MEC012	Engineering Drawing (2)	0	3	1	4	2
12	CIV175	Material Science	1	0	1	2	1
13	ARC114	Physics of Heat transfer and Airflow	2	2	1	5	3
14	ARC217	Physics of Lighting and Acoustics	2	2	1	5	3
15	ARC100	Summer Training (1)	0	0	0	0	0
16	ARC200	Summer Training (2)	0	0	0	0	0
17	ARC300	Field Training (1)	0	0	0	0	0
18	AEC400	Field Training (2)	0	0	0	0	0
19	ARC416	Graduation Project	2	8	0	10	6
Major Specialization Subjects (34+55+7 = 96 Contact Hours)							
1	ARC112	Architecture and construction	1	4	0	5	3
2	ARC116	Building Construction (1)	1	4	0	5	3
3	ARC212	Building Construction (2)	1	4	0	5	3

4	ARC113	Methods of Visual Expression	1	3	0	4	2
5	ARC111	History & Theories of Architecture (1)	2	2	0	4	3
6	ARC115	History & Theories of Architecture (2)	2	2	0	4	3
7	ARC211	History & Theories of Architecture (3)	2	2	0	4	3
8	ARC117	Computer Applications (1)	1	0	3	4	2
9	ARC213	Computer Applications (2)	1	0	2	3	2
10	CIV176	Structural Analysis	2	2	0	4	3
11	GED231	Surveying and Measurement	1	1	1	3	2
12	CIV273	Reinforced Concrete	2	2	0	4	3
13	CIV374	Steel Structures in Architecture	2	2	0	4	3
14	ARC311	Executive Design (1)	1	4	0	5	3
15	ARC315	Executive Design (2)	1	4	0	5	3
16	ARC411	Executive Design (3)	1	4	0	5	3
17	CIV373	Soil Mechanics & foundations	1	1	1	3	2
18	ARC413	Specification & Construction Management	2	2	0	4	3
19	ARC313	Plumbing & Electro-Mechanical Installation in buildings	2	3	0	5	3
20	ARC312	Urban Design	1	3	0	4	2
21	ARC412	Urban Planning (1)	1	3	0	4	2
22	ARC4xx	Specialized Elective Course list (2)	1	3	0	4	2
23	ARC4xx	Specialized Elective Course list (2)	2	0	0	2	2
24	ARC4xx	Specialized Elective Course list (3)	2	0	0	2	2
Minor Specialization Subjects (12+52+0 = 64 Contact Hours)							
1	ARC110	Architectural Design (1)	1	5	0	6	4
2	ARC114	Architectural Design (2)	1	5	0	6	4
3	ARC210	Architectural Design (3)	1	5	0	6	4
4	ARC215	Architectural Design (4)	1	5	0	6	4
5	ARC310	Architectural Design (5)	1	5	0	6	4
6	ARC314	Architectural Design (6)	1	5	0	6	4
7	ARC410	Architectural Design (7)	1	5	0	6	4
8	Arc317	Interior Design	1	3	0	4	2
9	ARC415	New Technology in Execution	1	4	0	5	3
10	ARC216	Building Construction (3)	1	4	0	5	3
11	ARC316	Planning and Landscaping of Urban Areas	1	3	0	4	2
12	ARC414	Urban Planning (2)	1	3	0	4	2

COURSES CLASSIFICATION
ARCHITECTURAL ENGINEERING PROGRAM

No.	Code	Course	Contact Hrs			
			Lec.	Tut.	Lab.	Total
Humanities & Social Science Subjects (12+7+1 = 20 Contact Hours)						
1	GEN0x0	Elective - Language requirements List	2	0	0	2
2	GEN011	Computer Skills	1	0	1	2
3	GEN012	History of Engineering & Technology	2	0	0	2
4	GEN90x	Elective - University Requirements list	1	1	0	2
5	GEN90x	Elective - University Requirements list	1	1	0	2
6	GEN90x	Elective - University Requirements list	1	1	0	2
7	GEN90x	Elective - University Requirements list	1	1	0	2
8	GEN90x	Elective - University Requirements list	1	1	0	2
9	GEN90x	Elective - University Requirements list	1	1	0	2
10	GEN90x	Elective - University Requirements list	1	1	0	2
Mathematics & Basic Sciences (21+15+14 = 50 Contact Hours)						
1	BAS010	Differential Calculus and Algebra	2	2	0	4
2	BAS011	Statics	2	1	2	5
3	BAS012	Engineering Chemistry	2	1	2	5
4	BAS013	Physics of Materials & Electricity	2	1	3	6
5	BAS014	Integral Calculus & Analytical Geometry	2	2	0	4
6	BAS015	Dynamics	2	1	2	5
7	BAS016	Physics of Light, Heat and Magnetism	2	1	2	5
8	BAS213	Statistics and Probabilities	2	1	0	3
9	CIV175	Material Science	1	1	1	3
10	ARC214	Physics of Heat Transfer and Airflow	2	2	1	5
11	ARC217	Physics of Lighting and Acoustics	2	2	1	5
Business Management (3+6+0 = 9 Contact Hours)						
1	ARC413	Specification & Construction Management	2	2	0	4
2	ARC415	New Technologies in Execution	1	4	0	5
Engineering Knowledge Subjects (7+5+3 = 15 contact Hours)						
1	MEC011	Production Technology & Workshops	1	0	2	3
2	ARC112	Architecture and Construction	1	4	0	5
3	ARC4xx	Specialized Elective Course list (2)	2	0	0	2
4	ARC4xx	Specialized Elective Course list (3)	2	0	0	2
5	GED231	Surveying and Measurement	1	1	1	3
Basic Engineering Science Subjects (23+43+7 = 73 Contact Hours)						
1	MEC010	Engineering Drawing (1)	0	3	0	3
2	MEC012	Engineering Drawing (2)	0	3	1	4
3	ARC117	Computer Applications (1)	1	0	3	4

4	ARC213	Computer Applications (2)	1	0	2	3
5	ARC113	Methods of Visual Expression	1	3	0	4
6	ARC111	History & Theories of Architecture (1)	2	2	0	4
7	ARC115	History & Theories of Architecture (2)	2	2	0	4
8	ARC211	History & Theories of Architecture (3)	2	2	0	4
9	ARC116	Building Construction (1)	1	4	0	5
10	ARC212	Building Construction (2)	1	4	0	5
11	ARC216	Building Construction (3)	1	4	0	5
12	ARC313	Plumbing & Electro-Mechanical Installation in Buildings	2	3	0	5
13	ARC4xx	Specialized Elective Course list (1)	1	3	0	2
14	CIV374	Steel Structures in Architecture	2	2	0	4
15	CIV176	Structural Analysis	2	2	0	4
16	CIV273	Reinforced Concrete	2	2	0	4
17	CIV373	Soil Mechanics & Foundations	1	1	1	3
18	ARC316	Planning and Landscaping of Urban Areas	1	3	0	4
Applied Engineering and Design Subjects (14+59+0 = 73 Contact Hours)						
1	ARC110	Architectural Design (1)	1	5	0	6
2	ARC114	Architectural Design (2)	1	5	0	6
3	ARC210	Architectural Design (3)	1	5	0	6
4	ARC215	Architectural Design (4)	1	5	0	6
5	ARC310	Architectural Design (5)	1	5	0	6
6	ARC314	Architectural Design (6)	1	5	0	6
7	ARC410	Architectural Design (7)	1	5	0	6
8	ARC311	Executive Design (1)	1	4	0	5
9	ARC315	Executive Design (2)	1	4	0	5
10	ARC411	Executive Design (3)	1	4	0	5
11	Arc317	Interior Design	1	3	0	4
12	ARC312	Urban Design	1	3	0	4
13	ARC412	Urban Planning (1)	1	3	0	4
14	ARC414	Urban Planning (2)	1	3	0	4
Projects and Field Training Subjects (10 Contact Hours)						
1	ARC100	Summer Training (1)	0	0	0	0
2	ARC200	Summer Training (2)	0	0	0	0
2	ARC300	Field Training (1)	0	0	0	0
3	AEC400	Field Training (2)	0	0	0	0
4	ARC417	Graduation Project	2	8	0	10

STUDY PLAN

PREPARATORY YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
BAS010	Differential Calculus and Algebra	2	2	0	4	60	0	60	120	3
BAS011	Statics	2	1	2	5	45	30	75	150	3
BAS012	Engineering Chemistry	2	1	2	5	45	30	75	150	3
BAS013	Physics of Materials & Electricity	2	1	3	6	45	45	90	180	3
MEC010	Engineering Drawing (1) ×	0	3	0	3	25	20	45	90	3
GEN0x0	Elective - Language requirements List	2	0	0	2	30	0	30	60	2
		10	**8**	**7**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lecture	Tutorial	Laboratory	Total	Semester Work	Lab./Oral Exam.	Written Exam.	Total	
BAS014	Integral Calculus & Analytical Geometry	2	2	0	4	60	0	60	120	3
BAS015	Dynamics	2	1	2	5	45	30	75	150	3
BAS016	Physics of Light, Heat and Magnetism	2	1	2	5	45	30	75	150	3
MEC011	Principles of Manufacturing Engineering†	1	0	2	3	25	20	45	90	3
MEC012	Engineering Drawing (2) ×	0	3	1	4	30	30	60	120	3
GEN011	Computer Skills ×	1	0	1	2	15	15	30	60	2
GEN012	History of Engineering & Technology	2	0	0	2	30	0	30	60	2
		10	**7**	**8**	**25**				**750**	

† In workshops, students are divided into groups 15 students/each, and a faculty stuff member (or an assistant) as well as a practical trainer will teach the group.

× In course MEC011, students are divided into groups 15 students/each. Two faculty stuff members or their assistants will teach each group.

FIRST YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
ARC110	Architectural Design (1) *	1	5	-	6	60	40	80	180	6
ARC111	History & Theories of Architecture (1)	2	2	-	4	60	-	60	120	4
ARC112	Architecture & Construction	1	4	-	5	60	30	60	150	5
ARC113	Methods of Visual Expression	1	3	-	4	70	-	50	120	4
CIV175	Material Science	1	-	1	2	20	10	30	60	3
BAS100	Statistics & Probabilities	2	2	-	4	60	-	60	120	2
		8	**16**	**1**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
ARC114	Architectural Design (2)	1	5	-	6	60	40	80	180	6
ARC115	History & Theories of Architecture (2)	2	2	-	4	60	-	60	120	4
ARC116	Building Construction (1)	1	4	-	5	60	30	60	150	5
ARC117	Computer Applications (1)	1	-	3	4	40	40	40	120	2
GEN90X	Elective from University Requirements list	1	1	-	2	20	10	30	60	2
CIV176	Structural Analysis	2	2	-	4	60	-	60	120	3
		8	**14**	**3**	**25**				**750**	

*** Prior to registering in first year, the student should have completed 3 weeks of training (ARC100) in summer for 5 days per week. The daily training is for 5 hours, amounting to a total of 25 hours per week. A maximum grade of 20 marks is added to the 'semester work' grades of the "Architectural Design (1)" (ARC110) course of first year.**

SECOND YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
ARC210	Architectural Design (3) *	1	5	-	6	60	40	80	180	6
ARC211	History & Theories of Architecture (3)	2	2	-	4	60	-	60	120	4
ARC212	Building Construction (2)	1	4	-	5	60	30	60	150	5
ARC213	Computer Applications (2)	1	-	2	3	30	30	30	90	3
ARC214	Physics of Heat Transfer & Airflow	2	2	1	5	60	30	60	150	3
GEN90X	Elective from University Requirements list	1	1	-	2	20	10	30	60	2
		8	**14**	**3**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
ARC215	Architectural Design (4)	1	5	-	6	60	40	80	180	6
ARC216	Building Construction (3)	1	4	-	5	60	30	60	150	4
ARC217	Physics of Lighting & Acoustics	2	2	1	5	60	30	60	150	3
GEN90X	Elective from University Requirements list	1	1	-	2	20	10	30	60	2
GED231	Surveying & Measurement	1	1	1	3	30	15	45	90	3
CIV273	Reinforced Concrete	2	2	-	4	60	-	60	120	3
		8	**15**	**2**	**25**				**750**	

*** Prior to registering in second year, the student should have completed 3 weeks of training (ARC200) in summer for 5 days per week. The daily training is for 5 hours, amounting to a total of 25 hours per week. A maximum grade of 20 marks is added to the 'semester work' grades of the "Architectural Design (3)" (ARC210) course of Second year.**

THIRD YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
ARC310	Architectural Design (5)	1	5	-	6	60	40	80	180	6
ARC311	Executive Designs (1)	1	4	-	5	60	30	60	150	5
ARC312	Urban Design	1	3	-	4	40	30	50	120	4
ARC313	Plumbing & Electro-mechanical installations in Buildings*	2	3	-	5	45	15	60	120	4
GEN90X	Elective from University Requirements list	1	1	-	2	20	10	30	60	2
CIV373	Soil Mechanics and Foundations	1	1	1	3	30	15	45	90	3
ARC300	Field Training (1) **	-	-	-	-	15	15	-	30	-
		7	**17**	**1**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
ARC314	Architectural Design (6)	1	5	-	6	60	40	80	180	6
ARC315	Executive Designs (2)	1	4	-	5	60	30	60	150	5
ARC316	Planning & Landscaping of Urban Areas	1	3	-	4	40	30	50	120	4
ARC317	Interior Design	1	3	-	4	40	30	50	120	4
GEN90X	Elective from University Requirements list	1	1	-	2	20	10	30	60	2
CIV374	Steel Structures in Architecture	2	2	-	4	60	-	60	120	3
		7	**18**	**-**	**25**				**750**	

*** This course is taught jointly by the Department of Architecture, Department of Electrical Engineering, and Department of Mechanical Engineering**

**** After the end of the second year, the student performs field training (1) during the summer period for a period of six weeks outside the college in a company or institution in the field of specialization under the supervision of faculty members outside the quorum of the supervising member, and the field training degree is calculated as (30 marks).**

FOURTH YEAR

First Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
ARC410	Architectural Design (7)	1	5	-	6	60	40	80	180	6
ARC411	Executive Designs (3)	1	4	-	5	60	30	60	150	5
ARC412	Urban Planning (1)	1	3	-	4	40	30	50	120	4
ARC413	Specifications and Construction Management	2	2	-	4	45	-	45	90	3
ARC4xx	Specialized Elective Course from List (1)	1	3	-	4	40	40	40	120	3
GEN90X	Elective from University Requirements list	1	1	-	2	20	10	30	60	2
ARC400	Field Training (2)*	-	-	-	-	-	30	-	30	-
		7	**18**	**-**	**25**				**750**	

Second Semester:

Code	Subject	Contact Hours				Marks				Duration of Final Examination (hours)
		Lec.	Tut.	Lab.	Total	Sem. Work	Lab./Oral Exam	Written Exam	Total	
ARC414	Urban Planning (2)	1	3	-	4	40	30	50	120	4
ARC415	New Technologies in Execution	1	4	-	5	60	30	60	150	5
ARC4xx	Specialized Elective Course from List (2)	2	-	-	2	30	-	30	60	3
ARC4xx	Specialized Elective Course from List (3)	2	-	-	2	30	-	30	60	3
GEN90X	Elective from University Requirements list	1	1	-	2	20	10	30	60	2
ARC416	Graduation Project**	2	8	-	10	180	120	-	300	-
		9	**16**	**-**	**25**				**750**	

*After the end of the third year, the student performs field training (2) during the summer period for a period of six weeks outside the college in a company or institution in the field of specialization under the supervision of faculty members outside the quorum of the supervising member, and the field training degree is calculated as (30 marks).

**The study for the graduation project lasts for six weeks after the completion of the second semester exams, and the final arbitration score (160 oral degrees) for the Bachelor project is divided equally between internal and external arbitration.

LIST OF TECHNICAL LANGUAGES ELECTIVE COURSES

#	Code	Contact Hours	Contact Hrs			
			Lec.	Tut.	Lab.	Total
1	GEN010	English Language	2	0	0	2
2	GEN020	German Language	2	0	0	2
3	GEN030	French Language	2	0	0	2

LIST OF ELECTIVE COURSES FROM UNIVERSITY REQUIREMENTS

#	Code	Contact Hours	Contact Hrs			
			Lec.	Tut.	Lab.	Total
1	GEN900	Communication & Presentation Skills	1	1	0	2
2	GEN901	Theory of Sustainability	1	1	0	2
3	GEN902	Human Rights and Combating Corruption	1	1	0	2
4	GEN903	Research & Analysis Skills	1	1	0	2
5	GEN904	Entrepreneurship	1	1	0	2
6	GEN905	Professional Ethics	1	1	0	2
7	GEN906	Critical Thinking	1	1	0	2
8	GEN907	Human Resources Management	1	1	0	2
9	GEN908	Contracts and Legislation	1	1	0	2
10	GEN909	Method of Scientific Research and Writing	1	1	0	2

LISTS OF SPECIALIZED ELECTIVE COURSES

#	Code	Contact Hours	Contact Hrs			
			Lec.	Tut.	Lab.	Total
List (1) of Specialized Elective Courses						
1	ARC420	Computational Design	1	3	-	4
2	ARC421	Computer Applications in Environmental Control	1	3	-	4
3	ARC422	GIS	1	3	-	4
4	ARC423	BIM	1	3	-	4
5	ARC424	Landscape of Parks & Open Spaces	1	3	-	4
List (2) of Specialized Elective Courses						
1	ARC425	Contemporary Architectural Trends	2	-	-	2
2	ARC426	Aesthetics and Art Criticism	2	-	-	2
3	ARC427	Vernacular Architecture	2	-	-	2
4	ARC428	Furniture Design	2	-	-	2
5	ARC429	Conservation of Heritage Buildings & Districts	2	-	-	2
List (3) of Specialized Elective Courses						
1	ARC430	Building Construction Equipment	2	-	-	2
2	ARC431	Project Management	2	-	-	2
3	ARC432	Building and Construction Insurance	2	-	-	2
4	ARC433	Integrated Architecture	2	-	-	2
5	ARC434	Environmental Impacts of Projects	2	-	-	2

ARCHITECTURAL ENGINEERING PROGRAM

	First Semester	Second Semester

FOURTH YEAR

ARC410	ARC411	ARC412	ARC413	ARC4xx	GEN90x	ARC400	ARC414	ARC415	ARC4xx	ARC4xx	GEN90x	ARC416
Architectural Design (7)	Executive Designs (3)	Urban Planning (1)	Specifications & Construction Management	Elective from List (1)	Elective from University Requirements List	Field Training (2)	Urban Planning (2)	New Technologies in Execution	Elective from List (2)	Elective from List (3)	Elective from University Requirements List	Graduation Project*
(1, 5, 0)	(1, 4, 0)	(1, 3, 0)	(2, 2, 0)	(1, 3, 0)	(1, 1, 0)		(1, 3, 0)	(1, 4, 0)	(2, 0, 0)	(2, 0, 0)	(1, 1, 0)	(2, 8, 0)

THIRD YEAR

ARC310	ARC311	ARC312	ARC313	GEN90x	CIV373	ARC300	ARC314	ARC315	ARC316	ARC317	GEN90x	CIV374
Architectural Design (5)	Executive Designs (1)	Urban Design	Plumbing and Electro-Mechanical Installations in Buildings	Elective from University Requirements List	Soil Mechanics & Foundations	Field Training (1)	Architectural Design (6)	Executive Designs (2)	Planning and Landscaping of Urban Sites	Interior Design	Elective from University Requirements List	Steel Structures in Architecture
(1, 5, 0)	(1, 4, 0)	(1, 3, 0)	(2, 3, 0)	(1, 1, 0)	(1, 1, 1)		(1, 5, 0)	(1, 4, 0)	(1, 3, 0)	(1, 3, 0)	(1, 1, 0)	(2, 2, 0)

SECOND YEAR

ARC210	ARC211	ARC212	ARC213	ARC214	GEN90x	ARC215	ARC216	ARC217	GEN90x	GED231	CIV273
Architectural Design (3)	History and Theories of Architecture (3)	Building Construction (2)	Computer Applications (2)	Physics of Heat Transfer & Airflow	Elective from University Requirements List	Architectural Design (4)	Building Construction (3)	Physics of Lighting & Acoustics	Elective from University Requirements List	Surveying and Measurement	Reinforced Concrete
(1, 5, 0)	(2, 2, 0)	(1, 4, 0)	(1, 0, 2)	(2, 2, 1)	(1, 1, 0)	(1, 5, 0)	(1, 4, 0)	(2, 2, 1)	(1, 1, 0)	(1, 1, 1)	(2, 2, 0)

FIRST YEAR

ARC110	ARC111	ARC112	ARC113	CIV175	BAS213	ARC114	ARC115	ARC116	ARC117	GEN90x	CIV176
Architectural Design (1)	History & Theories of Architecture (1)	Architecture and Construction	Methods of Visual Expression	Material Science	Statistics & Probabilities	Architectural Design (2)	History and Theories of Architecture (2)	Building Construction (1)	Computer Applications (1)	Elective from University Requirements List	Structural Analysis
(1, 5, 0)	(2, 2, 0)	(1, 4, 0)	(1, 3, 0)	(1, 0, 1)	(2, 2, 0)	(1, 5, 0)	(2, 2, 0)	(1, 4, 0)	(1, 0, 3)	(1, 1, 0)	(2, 2, 0)

PREPARATORY YEAR

BAS010	BAS011	BAS012	BAS013	MEC010	GEN010	BAS014	BAS015	BAS016	MEC011	MEC012	GEN011	GEN012
Differential Calculus and Algebra	Statics	Engineering Chemistry	Physics of Materials & Electricity	Engineering Drawing (1) ×	Technical Language	Integral Calculus & Analytical Geometry	Dynamics	Physics of Light, Heat &Magnetism	Production Technology & Workshops†	Engineering Drawing (2)	Computer Skills	History of Engineering & Technology
(2, 2, 0)	(2, 1, 2)	(2, 1, 2)	(2, 1, 3)	(0, 3, 0)	(2, 0, 0)	(2, 2, 0)	(2, 1, 2)	(2, 1, 2)	(1, 0, 2)	(0, 3, 1)	(1, 0, 1)	(2, 0, 0)

List of Technical Language Elective Courses

Elective Courses	GEN010 English Language	GEN020 German Language	GEN030 French Language

List of Elective Courses from University Requirements

Elective Courses	GEN900 Communication & Presentation Skills	GEN901 Theory of Sustainability	GEN902 Human Rights and Combating Corruption	GEN903 Research & Analysis Skills	GEN904 Entrepreneurship	GEN905 Professional Ethics	GEN906 Critical Thinking	GEN907 Human Resources Management	GEN908 Contracts and Legislation	GEN909 Method of Scientific Research and Writing

	List (1) of Specialized Elective Courses					List (2) of Specialized Elective Courses					List (3) Specialized of Elective Courses				
Elective Courses	ARC420 Computational Design	ARC421 Computer Applications in Environmental Control	ARC422 GIS	ARC423 BIM	ARC424 Landscape of Parks & Open Spaces	ARC425 Contemporary Architectural Trends	ARC426 Aesthetics and Art Criticism	ARC427 Vernacular Architecture	ARC428 Furniture Design	ARC429 Conservation of Heritage Buildings & Districts	ARC430 Building Construction Equipment	ARC431 Project Management	ARC432 Building and Construction Insurance	ARC433 Integrated Architecture	ARC434 Environmental Impacts of Projects

Matrix relating the program courses with competencies

Course Code	Course Name	Engineering Competencies (2018)										Architectural Engineering Competencies (NARS)						
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	B6	B7
BAS010	Differential Calculus and Algebra	√							√			√						
BAS011	Statics	√			√				√									
BAS012	Engineering Chemistry	√	√					√	√									
BAS013	Physics of Materials & Electricity	√	√					√	√									
MEC010	Engineering Drawing (1) ×	√					√		√									
GEN010	Elective from Technical Language List	√	√						√	√								
BAS014	Integral Calculus & Analytical Geometry	√							√			√						
BAS015	Dynamics	√			√	√			√									
BAS016	Physics of Light, Heat and Magnetism	√			√	√			√									
MEC011	Principles of Manufacturing Engineering†	√	√				√		√		√							
MEC012	Engineering Drawing (2) ×	√			√				√									
GEN011	Computer Skills ×	√	√						√		√							
GEN012	History of Engineering & Technology			√			√					√						
ARC110	Architectural Design (1)	√					√	√		√	√	√	√	√	√	√		
ARC111	History & Theories of Architecture (1)	√					√		√	√	√	√	√	√	√	√	√	√
ARC112	Architecture and Construction	√					√	√	√	√		√	√	√	√	√		

Course Code	Course Name	Engineering Competencies (2018)										Architectural Engineering Competencies (NARS)						
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	B6	B7
ARC113	Methods of Visual Expression	√				√	√	√	√		√	√	√	√	√	√		√
ARC114	Architectural Design (2)	√	√	√						√		√	√	√	√	√		
ARC115	History & Theories of Architecture (2)					√	√		√		√	√	√	√	√	√	√	
ARC116	Building Construction (1)	√	√		√		√	√		√	√	√	√	√	√	√		
ARC117	Computer Applications (1)				√				√						√	√	√	
CIV175	Material Science	√	√	√		√	√	√	√	√		√	√			√	√	
CIV176	Structural Analysis	√	√	√	√		√	√		√	√		√	√	√	√		√
BAS213	Statistics & Probabilities				√		√	√	√			√	√	√		√		
ARC210	Architectural Design (3)	√					√	√			√	√	√	√	√	√		
ARC211	History & Theories of Architecture (3)	√					√		√	√	√	√	√	√	√	√	√	√
ARC212	Building Construction (2)	√					√	√			√	√	√	√	√	√		
ARC213	Computer Applications (2)				√				√						√	√	√	
ARC214	Physics of Heat Transfer & Airflow	√					√				√	√	√	√	√	√		
ARC215	Architectural Design (4)	√					√	√			√	√	√	√	√	√		
ARC216	Building Construction (3)	√					√	√			√	√	√	√	√	√		
ARC217	Physics of Lighting & Acoustics	√					√					√	√	√	√	√	√	
GED231	Surveying and Measurement						√					√	√	√	√	√		√
CIV273	Reinforced Concrete		√	√	√	√	√					√	√	√	√	√	√	
ARC300	Field Training (1)			√		√								√	√	√		

Course Code	Course Name	Engineering Competencies (2018)										Architectural Engineering Competencies (NARS)						
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	B6	B7
ARC310	Architectural Design (5)				√	√	√	√	√	√	√	√	√	√	√	√		
ARC311	Executive Designs (1)	√	√				√	√	√	√		√	√	√	√	√		
ARC312	Urban Design						√		√	√		√	√	√	√	√		
ARC313	Plumbing and Electro-Mechanical Installations in Buildings	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	
ARC314	Architectural Design (6)	√	√	√	√		√	√	√		√	√	√	√	√	√		
ARC315	Executive Designs (2)	√	√	√			√	√	√	√		√	√	√	√	√		
ARC316	Planning and Landscaping of Urban Areas						√		√	√		√	√	√	√	√		
ARC317	Interior Design	√					√	√	√	√		√	√	√	√	√		
CIV373	Soil Mechanics & Foundations	√	√				√	√	√	√	√	√	√	√	√	√	√	
CIV374	Steel Structures in Architecture	√	√	√	√		√				√		√	√	√	√		
ARC400	Field Training (2)			√		√								√	√	√		
ARC410	Architectural Design (7)	√	√	√			√	√	√	√	√	√	√	√	√	√		
ARC411	Executive Designs (3)	√	√		√	√	√	√	√	√		√	√	√	√	√		
ARC412	Urban Planning (1)				√		√	√	√	√	√	√	√	√	√	√		
ARC413	Specifications & Construction Management	√	√	√			√	√	√	√		√	√	√	√	√		
ARC414	Urban Planning (2)		√				√		√	√		√	√	√	√	√		
ARC415	New Technologies in Execution	√	√	√		√	√	√	√	√		√	√	√	√	√	√	
ARC416	Graduation Project	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√
GEN90x	Elective from University Requirements List		√			√		√				√	√			√		

Course Code	Course Name	Engineering Competencies (2018)										Architectural Engineering Competencies (NARS)						
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	B6	B7
ARC43X	Elective Course List (1)				√				√		√				√	√	√	√
ARC33X	Elective Course List (2)				√		√	√	√			√	√	√		√		
ARC33X	Elective Course List (3)				√		√	√	√			√	√	√		√		

COURSES DESCRIPTION

قسم
الهندسة
المعمارية

FIRST YEAR

ARC100 Summer Training (1)

Prior to the beginning of the semester, students are to attend a three weeks training (five days per week/5 hours a day) for a total of 75 training hours (5 hours / 15 days). The training includes the following content: Introduction to architectural drawing (projection - Presentation) using Manual and technical drawing tools for both two and three-dimensional drawings, with practical exercises and practical applications. The grades of the course are to be added to the course of “Architectural Design (1)” ARC 110, represented by 20 grades.

References

1. Francis D.K. Ching, “Architecture: Form, Space and Order,” Van Nostrand Reinhold Company, 1979.
2. MARTIN, LESLIE. Architectural Graphics 2002. Mac Milan Publishers London

ARC110 Architectural Design (1) (1,5,0)

This course aims at developing students’ design skills through addressing the fundamentals of architectural drawings. This is fulfilled through identifying in-depth methods of architectural design, scale, building material terminologies, site analysis and context. The course also aims to develop students’ drawing and presentation skills through focusing on drawings fundamentals as projections and presentation techniques of the project plan, vertical sections, elevations, and layout. Students are taken progressively to understand three-dimensional drawings and models. Drawing abilities is gradually improved through the use of free-hand drawing and more advanced presentation drawing skills, to design suitable architectural projects. By the end of the semester, students will be able to present a design project of a simple unit such as (residence - villa - chalet – Guard room - bus station - or the like). The course teaching method depends on lectures, research, exercises and applied projects. Students' projects are evaluated mainly according to the quality of the drawing, projection accuracy, integration of architectural drawings, and good presentation.

References

1. Ching, Francis D.K., ’’Architecture: Form, Space and order’’ , 1979. Van Nostrand Reinhold Co., NY, USA.
2. Ernst and Peter Neufert, Architects Data, Recommended books.
3. Time Saver Standards for Architectural Design Data.
4. Alan Jefferis , David A. Madsen, "Architectural Drafting and Design", 2004 Cengage Learning.
5. Wiley, Ramsey Sleeper, (2007) , "Architectural Graphic Standards",11th Edition, American.
6. E. L. Koller Light, Shade & Shadow 2008 Dover Publications
7. MARTIN, LESLIE. Architectural Graphics. 2002Mac Milan Publishers London

Chiu-Shui Chan. ‘Style and Creativity in Design’ 2015

ARC111 History and Theories of Architecture (1) (2,2,0)

This course is divided into two parts, the first part “History of Architecture” aims provide the students with the knowledge of the phases and development of arts and architecture during ancient civilizations and early Middle Ages, covering the periods from the prehistoric era, until Early Christian and Byzantine eras, through studying the architectural and urban characteristics of the built environment during each period, as well as understanding the impact of natural, socio-cultural and technological factors on it. The students are trained to analyze various examples to identify the aesthetical, functional and structural values of them, and then recognize the similarities, differences between different periods to draw lessons which could develop architectural practice in the future. The second part, “Theories of Architecture” aims to make the students aware of the different factors that affect the architectural design and indicate design determinants. This includes the study of human scale and its effect on the size and form of different building components. It also aims to emphasize the importance of function and principles of functionalism in architecture, through the study of relationship matrix, bubble diagrams, space organization, design module, design concept, basic structural systems and construction methods, with an application on different types of buildings, such as houses, kindergartens, cafeterias and restaurants. Moreover, understanding different design techniques and concepts, through analysis selected projects for famous architects. Teaching is based on lectures, slide shows, field trips, doing research, drawing sketches for historic buildings and analyzing their architectural features.

References

1. Fletcher.B, 1996, A History of Architecture
2. Riseberro, B. Massachusetts 2012,The Story of Western Architecture The MIT Press, Cambridge
3. Mills, E.D. 1985 planning the architects handbook
4. Neufert, E. 1980 architects data
5. Dechiara, J, 1990 , Time -saver standards for buildings types
6. Architecture: Form, Space and Order 2007 John Wiley & Son Francis D.K. Ching
7. شكري،محمد انور،1986،العماره المصرية القديمة
8. سامي،عرفان،1967،نظريات عمارة
9. عبد الجواد،توفيق احمد،2008،تاريخ العمارة والفنون في العصور الاولي
10. محمد انور شكرى, 1986 "العمارة فى مصر القديمة" , الهيئة المصرية العامة للكتاب

ARC112 Architecture and Construction (1,4,0)

The course aims to acquire the student the ability to take advantage of the properties and capabilities of the available materials, materials and techniques to implement the various building elements. The course deals with: definition of the structural and architectural characteristics of natural and manufactured building materials / a general and comprehensive review of the characteristics of both ancient and traditional building systems / definition of modern and high-tech construction systems / familiarity with the construction characteristics of the various building elements / construction of walls of all kinds (load-bearing walls - retaining walls - Partitions - double walls and others) / building those walls from bricks (building bonds - implementing openings in the walls - arches and lintels - sessions and thresholds - projections and recesses - building walls with concrete blocks and others - strengthening and reinforcing walls), advanced and deep foundation construction systems, including piles foundations / construction systems for the simple roofs of small seas from different materials (wooden ceilings / reinforced concrete ceilings / stone and brick ceilings, and the student performs practical training inside the studio on all areas of the course during the semester.

References

1. Osama Al Nahas , "Building construction" 2015
2. W.B. McKay, M.Sc.Tech., M.I.Struct.E. , "McKay’s Building Construction, William Barr McKay ,2013"
3. Mitchel, "Building construction" 2002.
4. Medan Mehta, Scarborough , Armrest ,"Building Construction ",Prentice Hall, 2012
5. Building Design and Construction Handbook, Sixth Edition, 2001, McGraw-Hill: New York, San Francisco, Washington, D.C., Auckland, Bogotá, Caracas, Lisbon.
6. محمد عبدالله , "الانشاء المعمارى" , دار الكتب المصرية 1980
7. فاروق عباس حيدر , "تشييد المبانى" , دار الكتب المصرية

ARC113 Methods of Visual Expression (1,3,0)

This course aims at introducing the basics of visual architectural design through the primary study of geometric elements such as the point, the line, the plane, as well as primary shapes. Gestalt theory for visual perception is introduced in addition to basics of form generation in the 2D and 3D. The course introduces students to visual design fundamentals such as unity, harmony, proportion, golden ratio, color, texture, light, optical illusion, formulation, composition, etc. Through the use of pencils, ink, and colors. students are required to practice freehand drawings of provided models, existed buildings and natural scenes. Students also are introduced to the principles of shade and shadow of different architectural elements, as well as the fundamentals of perspective both exterior and interior. Students work includes class assignments and exercises through manual drafting and use of computer programs which reflect the gained knowledge of architectural representation.

References

1. Ching, Francis D.K., "Architecture: Form, Space and order’’, Van Nostrand Reinhold Co., NY, USA, 1979
2. Linda Holtzschue , Edward Noriega , "Design Fundamentals for the Digital Age", Wiley, 1997
3. Benjamin , Wucius Wong, "Visual Design on the Computer", W. W. Norton & Company, 2001
4. Hashimoto , Clayton, "Visual Design Fundamentals", Course Technology PTR, 2009
5. زكية شافعي، الظل والظلال، كلية الهندسة، جامعة القاهرة
6. زكية شافعي، المنظور الهندسي، كلية الهندسة، جامعة القاهرة
7. عبد الرحمن محمد نصار، الظلال – الظل – المنظور، مكتبة الأنجلو المصرية
8. سوسي أسكانيان، فن المنظور والاظهار المعمارى، ترجمة ربيح الحرستاني، دار الأيام للطباعة والنشر
9. فواز القضاة، الظل والمنظور الهندسي، دار مجدلاوي للنشر والتوزيع

CIV175 Material Science (1,1,1)

This course presents students to the various types of building materials. Students are introduced to the basics of mechanical, chemical and physical properties of construction materials. It familiarizes them with fundamentals of building materials testing, types, properties, usage and code of practice. Moreover, the course enables students to recognize the main properties of different engineering materials and to identify the testing methods to evaluate properties of different materials as stone, lime, sand, marble, wood, metals, etc. Field trips to sites, material and quality lab are to take place throughout the semester. Students are to submit technical reports based on the field trips.

References

1. Leonard Koren , William Hall "Concrete" , Phaidon Press , 2012
2. Egyptian code of practice and design of RC structures
3. Egyptian code for design aids for RC structures
4. Design of reinforced concrete structures- V1 by M. Ghoneim
5. Egyptian code for standard reinforcement detailing
6. ACI structural journal, American concrete institute
7. ACI material journal, American concrete institute

BAS213 Statistics & Probabilities (2,1,0)

The course aims to provide the student with basic knowledge in the following topics: Introduction to statistics, data processing and analysis, arithmetic mean and median, mode and standard deviation, computational inferences, statistical measures, measures of central tendency, measures of dispersion, probability theory, Biz theory, the random variable, and other topics that can be applied in engineering, architectural, operational and scientific research fields.

References

1- Joe D. Hoffman, Numerical methods for engineers and scientists, 2nd edition, Marcel Dekker, Inc. New York, 2001
John Schiller, R. Alu Srinivasanand Murray R. Spiegel, Schaum's Outline of Probability and Statistics, 4th ed.,McGraw Hill 2012.

ARC114 Architectural Design (2) (1,5,0)

This course aims to understand design concepts and the effective factors on the architectural design, as well as functional relations between spaces within buildings, through training on data gathering, layout studies and functional program schematics for different buildings through studying functional requirements, theories and design standards. The students are trained to analyze similar projects, and preparing plans Functional relationships, then developing them into an integrated architectural design. Thus, motivate the student's imagination towards developing architectural forms and design alternatives, while taking into consideration: environmental control of spaces, the aesthetic theory of the formation and articulation of facades, structural systems and contemporary building technology. Students are asked to apply the learnt skills and techniques to small projects such as residential unit, villa, kindergarten, or post office, etc. The method of teaching depends on lectures, research and exercises, and proposing design alternatives while presenting architectural projects through the use of free-hand drawing and more advanced presentation drawing skills, and the project is evaluated according to the functional requirements mainly, along with their compatibility with the site and their observance of the structural system which is suitable for the architectural morphology, the quality of the drawing, the accuracy of the projection and the integration of architectural drawings and good presentation.

References

1. Ching, Francis D.K., ’’Architecture: Form, Space and order’’, 1979Van Nostrand Reinhold Co., NY, USA.
2. Joseph de Chiare and John Hancock Callender,(1990) ,"Time Saver Standards for Building Types".
3. Time Saver Standards for Architectural Design Data.
4. Alan Jefferis , David A. Madsen, "Architectural Drafting and Design", 2004 Cengage Learning
5. Ernst and Peter Neufert, Architects Data,Recommended books
6. MARTIN, LESLIE. Architectural Graphics 2002. Mac Milan Publishers London
   Chiu-Shui Chan. ‘Style and Creativity in Design’ 2015

ARC115 History and Theories of Architecture (2) (2,2,0)

This course is divided into two parts: The first part "History of Architecture" aims to understand the changes and development that occurred in architecture during Middle Ages in both Europe and Islamic world, by teaching the characteristics and features of different architectural styles that appeared at that time, and the factors that led to them. The course includes the study of Romanesque and Gothic architecture in Medieval Europe, as well as the origins and development of Islamic architecture, with special focus on Islamic architecture of Egypt during its different periods (Caliphate, Umayyad, Abbasid, Tulunid, Fatimid, Ayyubid, Mamluk and Ottoman periods).

The second part of the course "Theory of Architecture" aims to inform the students of the basics and principles of architectural design, through studying the design considerations and appropriate solutions of horizontal and vertical circulation, car movements and parking areas, in addition to design criteria of different types of buildings, such as post offices, bank branches, outpatient clinics and conference halls.Teaching is based on lectures, slide shows, field trips, doing researches, drawing sketches for historic buildings and analyzing their architectural features.

References

1- حسن عبد الوهاب1946- تاريخ المساجد الأثرية - القاهرة
2- كمال الدين سامح، 1991، العمارة الإسلامية في مصر، الهيئة المصرية العامة للكتاب
3- حسن الباشا وآخرون، 1999، موسوعة العمارة والآثار والفنون الإسلامية، 4 أجزاء، أوراق شرقية للنشر
4- منظمة العواصم والمدن الإسلامية، أسس التصميم المعماري والتخطيط الحضري في العصور الإسلامية المختلفة بالعاصمة القاهرة، 1990
5- أحمد فكري، 1964، مساجد القاهرة ومدارسها، 5 أجزاء، دار المعارف
6- محمد حسن العيدروس، 2012، العصر الأندلسي – العمارة والفنون الأندلسية، دار الكتاب الحديث
7- K. A. C. Creswell ,1969.,Early Muslim Architecture, 2nd edition, vol. 1, 2 parts. Oxford

8- Creswell K. A. C. , 1978, Muslim Architecture of Egypt
9- CRESWELL K. A. C.. 1989, A Short Account of. Early Muslim Architecture.
10- CRUIKSHANK, Dan, Sir Banister Fletcher's: A History of Architecture, 20th Ed., Oxford, Architectural Press Books, 1996.
11- Mills, E.D. 1985 planning the architects handbook
12- Neufert, E. 1980 architects data
13- Dechiara, J, 1990 Time -saver standards for buildings types
CHARLESON, Andrew, Structure as Architecture, Oxford, Architectural Press, 2005.

ARC116 Building Construction (1) (1,4,0)

The course aims to acquire the student the ability to find technical solutions and choose the appropriate technical treatments to implement the various building elements by relying mainly on the investment of the properties and capabilities of the materials and raw materials used, and the course deals with topics: construction and refinement of the roofs of small and large seas in various situations using different construction materials such as wood, concrete and metals: Construction of reinforced concrete ceilings according to special systems and advanced technologies / frames / panel beams/ waffle slabs / construction of trusses of various kinds and from various materials, the student performs practical exercises inside the studio on all areas of the course.

References

8. Osama Al Nahas , "Building construction" 2015
9. W.B. McKay, M.Sc.Tech., M.I.Struct.E. , "McKay's Building Construction, William Barr McKay ,2013"
10. Mitchel, "Building construction" 2002.
11. Medan Mehta, Scarborough , Armrest ,"Building Construction ",Prentice Hall, 2012
12. Building Design and Construction Handbook, Sixth Edition, 2001, McGraw-Hill: New York, San Francisco, Washington, D.C., Auckland, Bogotá, Caracas, Lisbon.
13. محمد عبدالله , "الانشاء المعمارى" , دار الكتب المصرية 1980
14. فاروق عباس حيدر , "تشييد المبانى" , دار الكتب المصرية 1998

ARC117 Computer Applications (1) (1,0,3)

The course aims to introduce students to the use of CID in Architecture. This is achieved by enabling students to use specialized computer programs in Architecture drawings, as well as presentation and coloring computer aided programs, focusing on drawings and 2D presentation. Course teaching method is a demonstration in a computer lab on how to use different, specialized, continuously updated computer programs. Each student will undergo a various set of practical exercises to obtain the necessary skills to use CID in Architecture.

References

1. Linda Holtzschue , Edward Noriega , "Design Fundamentals for the Digital Age", Wiley, 1997 - Benjamin ,
2. Wucius Wong, "Visual Design on the Computer", W. W. Norton & Company, 2001

3. Hashimoto , Clayton, "Visual Design Fundamentals", Course Technology PTR, 2009

CIV176 Structural Analysis (2,2,0)

The course aims to identify the basic structural concepts for the performance of the various elements of the structure and methods of analysis and to extract the effect of external and internal forces in buildings, through the study of the theory of structures and methods of calculating the distribution of loads, reactions, shear forces, torsion and bending moments. Studio work is based on doing exercises designed to understand the analysis of structures and submitting assignments with the aid of lectures.

References

1- El-Dakhakhny, Structural Analysis: Part I, 8th ed., Dar-Al-Maaref, Cairo, Egypt, 2004. ISBN: 977 - 246-664-3.
2- Parker, H., and Ambrose, J.E., “Simplified Mechanics and Strength of Materials”, 5th ed., 1992, John Wiley & Sons; ISBN 0471541702
3- Beer, F.P., and Johnston,E.R., Jr. , "Mechanics of Materials”, McGraw Hill, 5th ed., 2001.

SECOND YEAR

ARC200 Summer Training (2)

Before joining the second year, the student attends a three-week training (five days a week for 5 hours per day) for a total of 75 training hours (5 hours / 15 days), and it aims at developing the architectural presentation skills of students, whether by manual methods (using Pencil, ink or colors of various types) or with the aid of computer applications that help in preparation and presentation of two-dimensional and three-dimensional drawings. The training also includes making of physical architectural models using different materials. The students perform practical architectural exercises and applications. The grades of the course are to be added to the course of “Architectural Design (3)” ARC 210, represented by 20 grades.

References:

1- Francis D.K. Ching, “Architecture: Form, Space and Order,” Van Nostrand Reinhold Company, 1979.
2- MARTIN, LESLIE. Architectural Graphics 2002. Mac Milan Publishers London
3- Wucius Wong, "Visual Design on the Computer", W. W. Norton & Company, 2001

ARC210 Architectural Design (3) (1,5,0)

This course is a continuation of the design stream, but more focused on spatial problems and comprehending space dynamics with reference to context. It develops the understanding of functional and spatial requirements as a basis for the generation of design solutions of circulation and the skill of comprehending architectural formations. The use of context is emphasized in the course through the study of site characteristics, climate, and urban and architectural context. The course focuses on buildings with moderately complex multi-functional programs. Students are asked to apply the learnt skills and techniques to multi-function projects such as schools, craft or heritage centers, laboratories, libraries, lodges, rest houses, or embassy buildings, with the selections of sites with distinctive natural, climatic or urban characteristics, such as sites overlooking sea, or heritage areas context, or sites of a desert or contour nature, or otherwise. Projects are evaluated according to their success in dealing with site characteristics mainly, as well as their fulfillment of functional, structural and aesthetic requirements, quality of drawing, projection accuracy, integration of architectural drawings and good visualization. The course comprises a combination of lectures, students’ presentation of design projects, precedents’ analysis, research assignments and 3D study models. Final projects are submitted using computer aided techniques.

References

1- Ching, Francis D.K., ’’Architecture: Form, Space and order’’, Van Nostrand Reinhold Co., NY, USA, 1979.
2- "Neufert, Architect’s Data, ’’Grosby Lockwood Staples’’, London, 1970
3- Donald Watson, Alan Plattus& Rebort Shibley, Time Saver Standard for Urban Design, McGraw-Hill.
4- Anthology of Beginning Design Projects’’, Van Nostrand Reinhold, 1993
5- White, Edward T., ’’A vocabulary of Architectural Forms’’, Architectural Media, 1975

6- cappleman, Owen-Jordan, Michel Jack, "Foundation in Architecture: An Annotated Anthology of Beginning Design Projects", Van Nostand Reinhold, 1993
7- Joseph de Chiare and John Hancock Callender,(1990) ,"Time Saver Standards for Building Types".
Time Saver Standards for Architectural Design Data.

ARC211 History and Theories of Architecture (3) (2,2,0)

This course is divided into two parts: The first part "History of Architecture" aims to understand the changes and developments that occurred in architecture from the end of middle Ages until the current era. This includes the study of Renaissance and post-Renaissance architecture, the rise and fall of Modern architecture, as well as the trends and movements of contemporary architecture, such as Post-Modernism, Late Modernism, Hi-tech architecture, Deconstructivism, green architecture, sustainable architecture and Digital architecture. The second part of the course "Theory of Architecture" aims to expand the students' knowledge of the principles of architectural design process from its functional, aesthetical and structural sides. This includes preparation of architectural program, study of space relationships, site selection, site analysis, solution techniques and design alternatives, with application on different types of buildings, such as hotels, libraries and schools. Teaching is based on lectures, slide shows, field trips, doing researches, drawing sketches for historic buildings and analyzing their architectural features.

References

1- MOFFETT, Marian, FAZIO Michael, WOEHOUSE, Laurence, A World History of Architecture, Laurence Publishing, London, 2003.
2- BENEVOLO, Leonardo, History of Modern Architecture, Cambridge, MIT Press, 1992.
3- CRUIKSHANK, Dan, Sir Banister Fletcher's: A History of Architecture, 20th Ed., Oxford, Architectural Press Books, 1996.
4- HONOUR Hugh & FLEMING John, A World History of Art, Laurence King, London 1999.
5- MURRAY, Peter, The Architecture of the Italian Renaissance, London, Thames & Hudson, 2007.
6- PICON, Antoine, French Architects and Engineering in the Age of Enlightenment, Cambridge, Cambridge University press, 1992.
7- ROTH, M. L., Understanding Architecture; Its Elements, History and Meaning, The Herbert Press, London, 1993.
8- TOMAN, Rolf, Baroque, Cologne, Ullmann & Könemann, 2007.
9- TOMAN, Rolf, The Art of the Italian Renaissance, Cologne, Ullmann & Könemann, 1995.
10- Joseph de Chiare and John Hancock Callender,(1990) ,"Time Saver Standards for Building Types",.
11- Wiley, Ramsey Sleeper, (2007) , "Architectural Graphic Standards",11th Edition, American.

ARC212 Building Construction (2) (1,4,0)

The course aims to complete the student's acquisition of the ability to find technical solutions and choose the appropriate technical treatments to implement the various building elements, through dealing with topics: vertical circulation elements in studying the construction of stairs and slopes of different types and materials / separations joints for each of: expansion, settlement, and construction / construction of temporary buildings includeing: formwork, scaffolding, reinforcement, restoration and repair works, and prefabricated works in buildings, and the student performs practical training in all areas of the course in addition to doing field research and technical reports.

References

1- محمد محمود عوضيه-تطوير الفكر المعماري بالقرن العشرين-دار النهضة-بيروت1984
2- فاروق عباس حيدر-الموسوعة الحديثة في تكنولوجيا تصميم المباني- دار النهضة-2003
3- م.توفيق عبد الجواد - م.محمد توفيق عبد الجواد - مواد البناء وطرق الإنشاء في المباني-دار النهضة 1998
4- الكود المصري لميكانيكا التربة وتصميم وتنفيذ الاساسات / الجزء الثالث - الاساسات الضحلة / الجزء الرابع - الاساسات العميقة
5- Course notes prepared by instructor
6- Barry's Advanced Construction of Buildings, 2010

ARC213 Computer Applications (2) (1,0,2)

The course aims to extend students' understanding of the use CID in Architecture as well as the urban field. Through the course students are introduces to Virtual Reality programs in static or animated shots as an aiding tool in Architectural Design and related Fields. In addition, students are exposed to virtual simulation programs and their use in presentation. The course comprises a combination of lectures devoted to computer programs updated with practical applications on various exercises.

References

1- Linda Holtzschue , Edward Noriega , "Design Fundamentals for the Digital Age", Wiley, 1997- Benjamin,
2- Wucius Wong, "Visual Design on the Computer", W. W. Norton & Company, 2001
3- Hashimoto , Clayton, "Visual Design Fundamentals", Course Technology PTR, 2009

ARC214 Physics of Heat Transfer & Airflow (2,2,1)

The course aims to provide students with the necessary knowledge and experience to understand the ways, methods, and theories of heat transfer through various materials, as well as the behavior of air movement in different spaces, in order to be applied in the design of the built environment so as to achieve the required comfort levels based on natural means. The course emphasizes on climate and its elements in different areas (indoor climate / the sun and its relationship with buildings / methods to protect buildings from solar radiation / thermal behavior of different buildings/ materials and building elements / solar radiation control and thermal insulation methods/ design of shading devices, air movement and indoor natural ventilation patterns) and natural ventilation techniques. Students assign a set of exercises to gain the talent to design a building space that meets the environmental requirements from the architectural point of view.

References

1- Peter F. Smith," Architecture in a Climate of Change- A guide to sustainable design "An imprint of Elsevier Linacre House, Jordan Hill, Oxford Second edition 2005.
2- Benoit Cushman- Roisin,"Building Ventilation in hot climates" 2017.
3- Norbert Lechner, "HEATING,COOLING,LIGHTING-Sustainable Design Methods for Architects" John Wiley&Sons.Inc,2015.

4- An Architect's Guide" Designing Spaces for Natural Ventilation " Taylor & Francis, 2015.
5- Peter F. Smith," Building for A Changing Climate-The Challenge for Construction, Planning and Energy" Earthscan in the UK and USA in 2010.
6- Hocine Bougdah and Stephen Sharpies, "Environment, Technology and Sustainability" Taylor & Francis, London and New York.2010.
7- Robert D. Brown, "Design with Microclimate- the Secret to Comfortable Outdoor Space" Island press, 2010 .
8- Peter F. Smith," Architecture in a Climate of Change- A guide to sustainable design "An imprint of Elsevier Linacre House, Jordan Hill, Oxford Second edition 2005.
9- Baruch Givoni, "Climatic Consideration in Building and Urban Design" Van Nostrand Reinhold, 1998.
10- Fuller Moore, "Environmental Control Systems – Heating, Cooling, Lighting" United States of America McGraw – Hill, Inc. 1993.
11- Richard L. Crowther, FAIA, "Sun/Earth- Alternative Energy Design for Architecture" Van Nostrand Reinhold Company, Australia.1989
12-دليل العمارة والطاقة " العمارة الخضراء والطاقة" جهاز تخطيط الطاقة – يوليو 1998م
13-د. ناهد فتحى عبد الغنى" الاسكان فى المناطق الصحراوية- دراسة نسق سريان الهواء فى الفراغات السكنية الخارجية الصحراوية فى المدن الجديدة بمصر" رسالة دكتوراة – هندسة شبرا-جامعة الزقازيق فرع بنها-1997م
14-د.م/ شفق العوضى الوكيل، د.م/ محمد عبد الله سراج " المناخ وعمارة المناطق الحارة" القاهرة 1989

ARC215 Architectural Design (4) (1,5,0)

The course aims to develop the student's ability to the requirements of the structural system and building techniques in the architectural design in order to enhance the functional and formative solutions of the building through deepening the student's awareness of the various construction systems and building materials. Thus, motivate the student's imagination towards developing architectural forms and design alternatives, while taking into consideration: structural systems and contemporary building technology. Students are asked to apply the learnt skills and techniques to multi-function projects such as residential buildings, commercial centers, administrative buildings, youth houses, multi-storey garages, etc. The method of teaching depends on lectures, research and exercises, and proposing design alternatives while presenting architectural projects through the use of free-hand drawing and more advanced presentation drawing skills, and the project is evaluated according to the functional requirements mainly, along with their compatibility with the site and their observance of the potential of structural systems, traditional and advanced building materials and techniques, as well as their fulfillment of the functional and aesthetic requirements of the building, the quality of drawing, projection accuracy, integration of architectural drawings and good visualization. Final projects are submitted using computer aided techniques.

References

1- CHARLESON, Andrew, Structure as Architecture, Oxford, Architectural Press, 2005.
2- Ching, Francis D.K., ''Architecture: Form, Space and order'', Van Nostrand Reinhold Co., NY, USA, 1979.
3- "Neufert, Architect's Data, ''Grosby Lockwood Staples'', London, 1970

4- Anthology of Beginning Design Projects'', Van Nostrand Reinhold, 1993
5- White, Edward T., ''A vocabulary of Architectural Forms'', Architectural Media, 1975
6- cappleman, Owen-Jordan, Michel Jack, "Foundation in Architecture: An Annotated Anthology of Beginning Design Projects", Van Nostand Reinhold, 1993
7- Joseph de Chiare and John Hancock Callender,(1990) ,"Time Saver Standards for Building Types".
8- Time Saver Standards for Architectural Design Data.

ARC216 Building Construction (3) (1,4,0)

The course aims to complete the student's acquisition of the ability to find technical solutions and choose the appropriate technical treatments to implement the various building elements, and the course deals with topics: finishing works, interior and exterior finishing of various building elements and components / general carpentry and delicate carpentry, including: Carpentry of doors, windows and fittings, blacksmithing works, and aluminum works / plaster works of various types / cladding works / painting works / suspended and false ceiling works / construction of special elements such as curtain walls, x-ray rooms, and refrigerators, and the student performs practical training in all areas of the course in addition To do field research and technical reports.

References

1- محمد محمود عوضيه-تطوير الفكر المعماري بالقرن العشرين-دار النهضة-بيروت1984
2- فاروق عباس حيدر-الموسوعة الحديثة في تكنولوجيا تصميم المباني- دار النهضة-2003
3- م.توفيق عبد الجواد - م.محمد توفيق عبد الجواد - مواد البناء وطرق الإنشاء في المباني-دار النهضة 1998
4- الكود المصري لميكانيكا التربة وتصميم وتنفيذ الاساسات / الجزء الثالث - الاساسات الضحلة / الجزء الرابع - الاساسات العميقة
5- Barry's Advanced Construction of Buildings, 2010

ARC217 Physics of Lighting & Acoustics (2,2,1)

The course aims to provide students with the necessary knowledge to understand Methods, techniques, and theories of light behavior, whether natural or artificial, as well as the behavior of sound waves in various spaces and materials, in order to be applied in the design of the built environment. The course aims to study the natural and industrial means to control lighting levels inside the building / explore techniques and methods to achieve the levels and quality of lighting required (light sources) inside the building. Students are to carry out experiments and measurements within environmental control labs and conduct indoor and outdoor lighting intensity measurements. Students study the natural and engineering methods to control the acoustic condition of the building / acoustic energy characteristics and methods. Indoor sound transmission / noise sources and methods of noise levels control within building spaces / sound insulation and absorption / sound insulation calculation methods and sound absorption capacity of the building / effect of indoor space design elements and its characteristics on acoustic state. Students will assign a set of exercises to gain the talent to design special spaces that require acoustics and lighting control such as theaters, cinema and recording studios.

References

1. م. احمد الخطيب" الصوتيات المعمارية- النظرية والتطبيق" مكتبة الانجلو المصرية 2003م.
2. دليل العمارة والطاقة " التصميم الصوتى للمبانى" -جهاز تخطيط الطاقة- يوليو 1998م

3. م/ جمال احمد عبد الحميد" الصوتيات فى المبانى التعليمية(المدارس)- دراسة تحليلية لأسس تصميم المدارس بالقاهرة الكبرى) رسالة ماجستير- جامعة القاهرة- 1998م.
4. Carl Hopkins," Sound Insulation"" Elsevier, Inc. 2007.
5. Jian Kang," Urban Sound Environment" Taylor & Francis.2007.
6. Marshall Long," Architectural Acoustics" Elsevier, Inc. 2006.
7. J.D.Quirt, T.R.T. Nightingale, F. King," Guide for Sound Insulation in Wood Frame Construction" National Research Council Canada, 2006.
8. M.W.Simons, J.R.Waters, " Sound Control in Buildings- A Guide to Part E of the Building Regulations" M.W. Simons and J.R. Waters, 2004.
9. Benz Kotzen and Colin English," Environmental Noise Barriers- AGuide to their Acoustics and Visual Design" Taylor & Francis e- Library.2001.
10. Y0ichi Ando, "Architectural Acoustics- Blending Sound Sources, Sound Fields, and Listeners" Springer-Verlag New York, Inc. 1998.
11. Charles W.Harris, Nicholas T, Dines." Time Saver Standards for landscape Architecture – Design & construction Data" McGraw – Hill publishing company. 1998.
12. Duncan Templeton & David Saunders. "Acoustic Design" The architecture press London, 1987.
13. Peterlord, Duncan Templeton," The Architecture of sound- Designing Places of Assembly" Peter Lord& Duncan Templeton.1986.
14. O.H Koenigsberger. T.G. Ingersole. Alan Mayhew. S.V. Szok0lay." Manual of tropical housing and building" longman group limited london, 1973.
15. Carl Hopkins," Sound Insulation"" Elsevier, Inc. 2007.
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17. Marshall Long," Architectural Acoustics" Elsevier, Inc. 2006.
18. Egan, M. D. and Olgae V., Natural Lighting, McGraw-Hill Inc., (2002).
19. Egan, M. D., Concepts in Architectural Acoustics, McGraw-Hill Inc., (1983).
20. Evans, Benjamin H. AIA., Daylighting in Architecture, Architectural Record Books, McGraw-Hill Inc., (1981).
21. J.E. Moore, Friba, Design for good Acoustics, Architectural Press, London, (1967).
22. Moore, F., Concepts and Practice of Architectural Daylighting, New York: Van Nostrand Reinhold, (1991).
23. Lawrance Berkeley Laboratory, Predicting Daylight and Lighting Performance, Regents of the University of California, (1994).

GED231 Surveying and Measurement (1,1,1)

This course aims to enhance students' knowledge and understanding of surveying and its importance for different engineering projects. Special attention is directed to distance measurements and their application to construct cadastral maps with special highlight of map scale and its representation. Angular measurements by surveying instruments conventional and modern are introduced throughout the course. Compass/ Theodolite/total station and their applications for bearing measurements and measurements of sides and angles of traverses for co-ordinates computations are also clarified. Leveling process and its application to construct maps with highlight of their importance and applications. Earth works computation of areas and volumes. The above-mentioned contents of the course are given through assignments, practical application, training on different surveying instruments (conventional and modern) with mentioning to the different computer program used in different application.

References

1- Course notes prepared by instructor

2- All surveying text books in the faculty library
3- Surveying NARINDER SINGH 1982
4- Surveying and levelling R. Agor 1984

CIV273 Reinforced Concrete (2,2,0)

The course aims to provide the student with the methods of calculating the reinforced concrete structures, by studying the design of concrete sections for slabs and cantilevers, in addition to the analysis and design of solid slabs one-way and two-way and hollow slabs. Moreover, the course introduces students to terminology and structural drawings, as well as training students to make structural designs through submission of practical exercises and assignments.

References

1- Lecture notes and handouts prepared by instructor
2- Egyptian code of practice and design of RC structures
3- Egyptian code for design aids for RC structures
4- Design of reinforced concrete structures- V1 by M. Ghoneim
5- Egyptian code for standard reinforcement detailing
6- ACI structural journal, American concrete institute
7- ACI material journal, American concrete institute

THIRD YEAR

ARC300 Field Training (1) (0,0,0)

After accomplishing first-year courses, students should spend at least four weeks in practical-training. Student are to provide a report describing a complete description of the achieved training course. The report should show the technical and scientific skills acquired during the training period. Finally, the report is reviewed by an academic committee from the department for approval.

ARC310 Architectural Design (5) (1,5,0)

The course is a continuation of the design stream with more emphasis on the architectural spatial experience between and within the indoors and outdoors. The course aims to expose students to experience, visualize, perceive and learn to create different types of indoor and outdoor spaces, and to gain a deep understanding for the relationship between them. The course builds through research involving contextual and cultural analyses, data gathering techniques, precedents' analysis, and methods of concept generation. Spatial experience is emphasized through presenting students with a typology of complex, specified, and multi-functional projects Students are asked to apply the learnt skills and techniques to in the detailed design of a building or a group of buildings with complex, complex and multi-functional relationships, such as hotel buildings, administrative, commercial and residential complex, health centers, hospitals, or transportation stations, such as bus stations, and airports, etc. Projects are evaluated according to their success and creativity in meeting the conflicting and overlapping functional and construction needs of the project components in a compatible manner, in addition to effectively dealing with the characteristics of the site and its surroundings, and taking into account the functional and aesthetic requirements, quality of drawing, projection accuracy, integration of architectural drawings and good visualization.. The course comprises a combination of lectures, students' presentation of design projects, precedents' analysis, research assignments and 3D study models. Final projects are submitted using computer aided techniques.

References

1- Time Saver Standards for Architectural Design Data.
2- Time Saver Standards for Building Types,
3- Time Saver Standards for Landscape
4- Wiley, Ramsey Sleeper, "Architectural Graphic Standards"
5- Neufert, E., "Neufert Architect's Data", Crosby Lockwood Staples, London
6- Illustration Book Series
7- Korean Architecture Series

ARC311 Executive Designs (1) (1,4,0)

This course aims to introduce students to the basics and fundamentals of the various executive designs and their requirements for the development of the preliminary project to be transformed into executive reality. Students are encouraged to find the optimal technical solutions to building problems. The course provides students with the skills of the execution drawings of the architectural works. Students explore the finishing materials of building facades. The course addresses the fundamentals and international codes used for execution drawings standards (symbols and terms used in each). Students produce execution drawings for a practical preliminary project at the studio that includes different plans, comprehensive elevations and sections with all dimensions, levels, labels, annotations, as well as the tables of finishing materials and openings tables. Computer could be used for drafting purposes.

References :

1- B.T Batsford Ltd, Derek Osbourn &Reger Greeno, Mitchell's Building Construction, 2007 .
2- IBC, International Building Code, AIA, 2009 .
3- Joseph De Chiara, Time Saver for Interior Design and Space Planning, McGraw-Hill, 1991.
4- IBC, International Building Code, AIA, 2012

ARC312 Urban Design (1,3,0)

The course aims to analyze and assimilate the physical and moral relations between humans and the urban environment and the reflection of cultural, social, environmental and economic influences on the formation of urban spaces. The course aims to study the visual structure of the city and its interrelationships through the study of urban needs / components of the space / engineering construction, visual and aesthetic of public spaces / heritage urban fabric and concepts of conservation / integration of buildings in the surrounding urban environment. The course also aims at developing student's abilities to create an urban environment that interacts and integrates with the characteristics of the urban environment by studying: components of the visual image of the space, movement in the spatial modulation, corridors network, visual and urban formation, and the local environmental dimensions and their impact on the elements of site coordination. Students design a detailed project for one of the existing urban spaces through the study and analysis of the existing situation, in order to make design proposals for an idea developed based on a set of design alternatives to these spaces. Computer aided techniques are used in final submissions.

References

1. Golany, G.,(1976) New Town Planning Principles and Practice. London : John Wiley and sons,.
2. Golany, G., (1978) International Urban Growth & polices – New towns contribution, London : Wiley inter science publication
3. Joseph Dechiara, Gulius Panero, and Martin Zelnik, "Time-saver Standards for Interior Design and Spaces planning", Second Edition, by The McGraw-Hill companies, 2001.
4. City of Victoria Planning. (2006) Downtown Core Area Plan. 14-21. BC Canada: Planning Department.

ARC313 Plumbing and Electro-Mechanical Installations in Buildings (2,3,0)

This course aims to provide students with the required knowledge about plumbing and electro-mechanical installations in order to achieve a sound public health environment for architectural projects. Students will achieve this objective by studying the following; a) various methods, technologies and systems related to water and drainage networks as well as liquid and solid waste disposal, b) best practices for electro-mechanical installation systems including their modem operandi, requirements and safety measures inside buildings. Students will master the above-mentioned objectives via exploring the various systems and technologies as well as their mechanical installation pre-requisites such as air-conditioning, lifts, escalators, circulation of loaders and service cranes, electric extensions, fire detection and firefighting and safety systems in buildings …etc. At the end of this course students will be able to perform the following; a) successfully conduct applied tests in both the environmental and plumbing installations lab, b) safely conduct field research in order to evaluate the used methods and technologies, both in and out of the university, and draw lessons learned, c) efficiently produce architectural drawings in the form of coordinated working drawings for the different disciplines using the latest software in the field.

References

1- الكود المصري لأسس تصميم وشروط التنفيذ لهندسة التركيبات الصحيه
2- الكود المصري للكهرباء فى أسس تصميم وشروط تنفيذ التوصيلات والتركيبات الكهربائية فى المباني
3- الكود المصري لأسس تصميم وشروط تنفيذ أعمال تكييف الهواء والتبريد
4- الكود المصرى لاسس التصميم وشروط تنفيذ المصاعد الكهربائية والهيدروليكية فى المبانى

CIV373 Soil Mechanics and Foundation (1,1,1)

This course aims to provide students with the basic soil properties, soil classification, soil permeability, field and laboratory compaction tests-stress distribution in soil, soil settlement, soil shear strength-lateral earth pressure, types of retaining structures, bearing capacity of soil, main types of foundation design, soil analysis and reports using soil laboratory

References :

1- Bowel, 1975 "Foundation Analysis and Design "
2- Egyptian Code of practice for soil mechanics and foundation design

ARC314 Architectural Design (6) (1,5,0)

The course is a continuation of the design stream; it extends students' understanding of the factors that affect/influence design. The course emphasizes on the socio-cultural contexts as well as the physical. The course addresses the urban fabric with all its heritage, cultural, and humanitarian elements, thus reaching the complete integrated design concept and achieving creative architectural formulations. Students are asked to apply the learnt skills and techniques to projects related to different types of human needs, such as homes for the elderly, orphanages, rehabilitation centers for people with special abilities, hospital resorts, museum buildings, art galleries, training, educational or rehabilitative centers, or social and sports clubs, With the choice of sites with distinct cultural and social contexts, such as sites located near heritage, traditional, popular or rural areas, or located in the city center or in the suburbs, or in crowded and congested areas or open and extended. Projects are evaluated according to their success and creativity in meeting the conflicting and overlapping functional and construction needs of the project components in a compatible manner, in addition to effectively dealing with the characteristics of the site and its surroundings, and taking into account the functional and aesthetic requirements, quality of drawing, projection accuracy, integration of architectural drawings and good visualization. The course comprises a combination of lectures, students' presentation of design projects, precedents' analysis, research assignments and 3D study models. Final projects are submitted using computer aided techniques.

References :

1- Time Saver Standards for Architectural Design Data.
2- Time Saver Standards for Building Types,
3- Time Saver Standards for Landscape
4- Wiley, Ramsey Sleeper, "**Architectural** Graphic Standards"
5- Neufert, E., "Neufert Architect's Data", Crosby Lockwood Staples, London
6- Illustration Book Series
7- Korean Architecture Series

ARC315 Executive Designs (2) (1,4,0)

The course aims to find executive solutions to the problems of construction and finishing for the various elements of the building. Students are encourages to select appropriate materials for internal and external finishing based on scientific guidelines. The course develops students' abilities to address complex problems and find advanced executive design solutions that relate to the environment within the buildings. Students' abilities are shown in the renewal, development and technical control of various aspects of the problems. Students conduct practical training in the studio on selected preliminary projects showing a range of special problems, such as humidity, water leakage, noise, climate temperature, etc. Moreover, students apply advanced construction systems, modern construction techniques and high-tech finishing, which require non-traditional solutions and executive treatments using computer-based tools.

References

1- Abd El Gawad, Tawfic, Building Material and Building Construction .
2- Mitchell's, ''Building Construction'', B.T.Batsford ltd London
3- Time savor standard for building types,''Time savor standard for landscape ''
W.B. McKay, "Building Construction'', Longm

ARC316 Planning and Landscaping of Urban Areas (1,3,0)

The course aims to study the concept of residential areas and the foundations of planning urban housing communities. The course introduces students to the development of residential areas through the study of demography and service rates/ land use and division, rates of basic services for population sizes and space distribution format - land use budget, the distribution and grading of road networks to serve residential areas/ types of housing. Students are exposed to the morphology of landscape, types of soft and hard landscape elements and the characteristics and specifications of the use of each element. Urban and landscape detailing are studied. Students prepare practical applications for a detailed plan with the application of the specific requirements for the development of residential areas and the application of the outputs of GIS programs or the like. Moreover, students present landscape drawings to an assigned open space.

References

1. Simonds, John Ormsbee, “Landscape Architecture,” MC Graw-Hill Book Company.
2. W.Reid, Grant, “Landscape Graphics,” Whitney Library of Design, New York.
3. د. محمد حماد، م. محمد فتحي سالم، " التشجير المعماري، في زراعة انواع نباتات الزينة لتنسيق الحدائق،" 1971.
4. د. مصطفى بدر، "تنسيق وتجميل المدن والقرى،" منشأة المعارف، الاسكندرية، 1992.

ARC317 Interior Design (1,3,0)

This course aims to enhance students’ basic design skills in interior design of architectural spaces. The role of colors, texture and materials is introduced. Students are required to demonstrate their knowledge in practical project(s) by solving indoor spatial problems for human activities.

References

1- allen tate, c. ray smith. INTERIOR DESIGN OF THE 20TH CENTURY . harper & row , 1986.
2- binggeli, corky. Interior Design &Interior Architecture . wiley, 2007.
3- Ching, Frank. interior design illustrated. john wiley &sons, 1987.
4- linton, harold. color in architecture . 1999.

CIV374 Steel Structures in Architecture (2,2,0)

The course aims to provide students with methods and techniques for calculating and designing metal structures, including the study of steel elements such as columns, beams, trusses and techniques for the connecting various steel elements, taking into account the principles of selecting the appropriate structural metal systems to achieve the architectural function of space. The course also aims at understanding the requirements of the structural system to be taken into consideration in the architectural design. It also aims to identify the structural systems of the metal structures, especially halls and hangars, and to identify the high capacity of the formation to serve the design process of buildings, as well as to identify the advantages and disadvantages of metal structures. Students are trained in applications through the exercises given.

References

1- E. B. Machaly "Behavior, Analysis and Design of Stuctural Steel Elements, volume 1", 2002, ISBN 2002-2939
2- E. B. Machaly "Behavior, Analysis and Design of Steelwork Connections, volume 3" 2002, ISBN 2002-2939

Charles G. Salmon, John E. Johnson, "Steel Structures: Design and Behavior", Edition 5, ISBN-13: 9780131885561, October 2008

FOURTH YEAR

ARC400 Field Training (2) (0,0,0)

After completing the second-year courses, students should spend at least four weeks training in an engineering institution; each student shall prepare a report at the end of the training session describing a complete description of his training course. The report should show the technical and scientific skills acquired during the training period, finally the report is discussed and evaluated by an academic committee.

ARC410 Architectural Design (7) (1,5,0)

The course is a continuation of the design stream; it affirms students' comprehension of architectural approaches. The course introduces students to different philosophical approaches to design concepts. The course integrates knowledge acquired from previous design courses where more emphasis is achieved on the functional requirements, environmental issues and sustainability. The course aims to introduce students to complex design problems that need functional, structural considerations and address physical and cultural environmental attributes with a philosophical approach. This is done through training the student to deal with and study complex projects with multiple functional relationships and various uses, within a surrounding urban environment with distinctive characteristics, such as cultural, craft, developmental or scientific centers, art complex, theatres and cinemas, conference centers or Exhibitions, business centers, etc. The projects are evaluated according to the student's creativity in providing an integrated philosophical approach to the design of the project, which meets the functional, aesthetic and construction requirements of the building, and takes into account the characteristics of the sites and surroundings, the characteristics of the social, cultural and economic context, the material and moral needs of the users in a unique and distinctive way, in addition to the quality of the drawing, the accuracy of the projection and the integration of architectural drawings And good presentation. The course comprises a combination of lectures, students' presentation of design projects, precedents' analysis, research assignments and 3D study models. Final projects are submitted using computer aided techniques.

References

1- Watson, Donald. Time Saver Standards for Architectural Design Technical Data for Professional Practice, McGraw Hill. New York. 8th Ed. 2005.
2- De Chiara ,Joseph. Time-Saver Standards for Building Types, McGraw Hill. New York. 4th Ed. 2001
3- Harris ,Charles. Time-Saver Standards for Landscape Architecture, McGraw Hill. New York., 2nd Ed. 1998
4- Ramsey , Charles George. Architectural Graphic Standards, John Willy & Sons. USA. 11th Ed. 2008.
5- Neufert, Ernst. Neufert Architects' Data, Willy-Blackwell publishing, USA. 4th Ed. 2012.
6- Lawson, Bryan. How Designers Think. Architectural Press. Oxford. 2005.

7- Choi, Beatrice - Yoon, Shyann - Lee, Sung Min. Digital Diagram II (Architecture + Interior). Archiworld Co. Ltd. Korea. 2008
8-Mortenson, M,E. Geometric Modeling. Industrial Press Inc. New York. USA. 2006
9-Tunstall, Gavin. Managing The Building Design Process, Elsevier Ltd, London, 2006

ARC411 Executive designs (3) (1,4,0)

The course aims to prepare an integrated set of detailed drawings, including plans, facades, sections, finishes, openings tables, ladders, elevators, and the preparation of an integrated set of architectural drawings and electromechanical complementary works. At the end of the course, students provide an integrated set of implementation documents for a comprehensive applied project, including the specifications and terms documents for selective items, as well as the feasibility study report of the design decisions of the project using appropriate computer software.

References

1- Bruce Bassler, Ncarb," Architectural Graphic Standards Student Edition", Eleventh Edition, John wiley and Sons, Hoboken, New Jersey, Published simultaneously in Canada, 2008 .
2- Joseph Dechiara, Gulius Panero, and Martin Zelnik, "Time-saver Standards for Interior Design and Spaces planning", Second Edition, by The McGraw-Hill companies, 2001 .
3- RALPH W.liebing. MIMIFORD PAUL, "Architectural Working Drawings", by John Wiley and Sons, 1983.
4- Francis D.K.ching, "Building Construction illustrated", fifth edition, by Johen Wiley and Sons, 2014.
5- James Am Brose, "Building Construction and design", Van Nostrand Reinhod, 1992
6- فاروق عباس حيدر, عمر فاروق حيدر ، "الموسوعة الحديثة فى تكنولوجيا تشييد المبانى الهندسة الصحية والتركيبات الصحيه" ، الطبعة الثامنه ، منشأة المعارف بالإسكندرية , 2009.
7- فاروق عباس حيدر, "أساسيات بناء المباني ", الجزء الأول, الطبعه السادسه, منشأة المعارف بالاسكندريه, 1999.
8- فاروق عباس حيدر, "تشييد المباني الأسقف والتشطيبات وخدمات المباني ورسومات تنفيذية",
9- الجزء الثاني, الطبعه السابعه, منشأة المعارف بالاسكندريه.

ARC412 Urban Planning (1) (1,3,0)

The course aims to teach the student to prepare the necessary studies of strategic planning (villages / cities), current status studies, urban and social survey (structure / patterns of centers / growth patterns), population and housing studies, land use, economics and localization of development projects. Students present practical applications on one of the existing Egyptian cities / villages and attains the necessary studies to prepare the development plan for the city / village using GIS or similar programs.

References :

1- غريب محمد أحمد "مجتمع القرية-دراسات وبحوث" -دار المعرفة الجامعية- الإسكندرية - ١٩٨٧ م
2- ماجد، صبيح "مدخل إلى التخطيط والتنمية الاجتماعية- الشركة المتحدة للتوريد والتسويق – القاهرة- 2014م.
3- Gehl.Jan –"Life Between Building –Using Public Spaces" V.N.R ,New York-1987.

4- Rapoport ,A- "The meaning of the built environment-" California: Sage publications, Inc- 1982.
5- ZUCHELLI ALBERTO: INTRODUCTION A LURBANISME OPERATIONNEL A LA COMPOSITION URBAINE VOLUME, OPU ALGERE 1983.

ARC413 Specifications and Construction Management (2,2,0)

The course aims to prepare Tender documents to the executive drawings and for explaining and describing business items and counting their quantities (BOQ) with an understanding of the measurement method used to calculate the quantities, accounting methods, price analysis, specifications of business items, general and specific conditions for implementation documents according to global and local standards and systems, preparing business index for various items. On the other hand, the course deals with understanding of the local and international contract systems, and an understanding of the nature of the parties participating in the contracts and their responsibilities.

References

1- IBC, 2009, “International Building Code”, AIA.
2- Joseph De Chiara, 1991,“Time Saver for Interior Design and Space Planning”, McGraw-Hill.
4- الكود المصري لتصميم وتنفيذ المنشأت الخرسانية , 2001 , اللجنة الدائمة للكود المصرى , دار الكتب المصرية

ARC414 Urban Planning (2) (1,2,0)

The course deals with the foundations and methods of preparing urban development plans for cities and urban development policies: analysis of the current situation, planning alternatives, studies of infrastructure elements system, service sectors and programs, and methodologies for the preparation of the strategic plan of the village / city. Students perform practical applications on one of the existing Egyptian cities / villages for the purpose of preparing the development plan for the city using the outputs of GIS or similar programs.

References

1- غريب محمد أحمد "مجتمع القرية-دراسات وبحوث" -دار المعرفة الجامعية- الإسكندرية - ١٩٨٧ م
2- ماجد، صبيح "مدخل إلى التخطيط والتنمية الاجتماعية- الشركة المتحدة للتوريد والتسويق – القاهرة- 2014م.
3- Gehl.Jan –“Life Between Building –Using Public Spaces” V.N.R ,New York-1987.
4- Rapoport ,A- "The meaning of the built environment-" California: Sage publications, Inc- 1982.
5- ZUCHELLI ALBERTO: INTRODUCTION A LURBANISME OPERATIONNEL A LA COMPOSITION URBAINE VOLUME, OPU ALGERE 1983

ARC415 New Technologies in Execution (1,4,0)

The course aims to provide students with the knowledge and experiences necessary to develop their abilities. Throughout the course students deal with the sources and products of the construction industry relying on digital technological means to identify and select modern products in the construction industry for both constructions, finishing and buildings equipment preparations. Students determine the requirements and specifications of some elements of the composition and finishing materials of projects that are under the executive design process, then gathering the data of the appropriate products/ techniques. Students are trained to evaluate and approve the validity of the desired product and develop the designs of his project to comply with selected products. Finally, students submit detailed drawings (shop drawing) using appropriate computer software with documentation and clarification of how to use and install the product in its specific location. Students provide a technical report on the specifications of the chosen product for the requirements for its installation, operation and maintenance via its various stages.

References

1- Bruce Bassler, Ncarb," Architectural Graphic Standards Student Edition", Eleventh Edition, John wiley and Sons, Hoboken, New Jersey, Published simultaneously in Canada, 2008 .
2- Joseph Dechiara, Gulius Panero, and Martin Zelnik, "Time-saver Standards for Interior Design and Spaces planning", Second Edition, by The McGraw-Hill companies, 2001
3- RALPH W.liebing. MIMIFORD PAUL, "Architectural Working Drawings", by John Wiley and Sons, 1983.
4- Francis D.K.ching, "Building Construction illustrated", fifth edition, by Johen Wiley and Sons, 2014.
5- James Am Brose, "Building Construction and design", Van Nostrand Reinhod, 1992.
6- فاروق عباس حيدر, عمر فاروق حيدر ، "الموسوعة الحديثة فى تكنولوجيا تشييد المبانى، منشأة المعارف بالإسكندرية.

ARC417 Graduation Project (1,11,0)

This course is based on the previously prepared research thesis, which concluded a functional program for the graduation project (research and analysis skills GEN 411). The course aims to emphasize the integration of all the previously gained knowledge from the previous courses. The course addresses students' ability to solve technical and executional problems in the field of architecture with emphasis on value and distinct in architectural formulations. The submitted graduation project is to be characterized by originality and innovation. Students are encouraged to develop their own vision, concepts and skills in the preparation and presentation of the project.

References

1- Watson, Donald. Time Saver Standards for Architectural Design Technical Data for Professional Practice, McGraw Hill. New York. 8th Ed. 2005.
2- De Chiara ,Joseph. Time-Saver Standards for Building Types, McGraw Hill. New York. 4th Ed. 2001
3- Harris ,Charles. Time-Saver Standards for Landscape Architecture, McGraw Hill. New York., 2nd Ed. 1998
4- Ramsey , Charles George. Architectural Graphic Standards, John Willy & Sons. USA. 11th Ed. 2008.
5- Neufert, Ernst. Neufert Architects' Data, Willy-Blackwell publishing, USA. 4th Ed. 2012.
6- Lawson, Bryan. How Designers Think. Architectural Press. Oxford. 2005.
7- Choi, Beatrice - Yoon, Shyann - Lee, Sung Min. Digital Diagram II (Architecture + Interior). Archiworld Co. Ltd. Korea. 2008
8- Mortenson, M,E. Geometric Modeling. Industrial Press Inc. New York. USA. 2006

Specialized Elective Courses

List (1) of Specialized Elective Courses

ARC420 Computational Design (1,3,0)

The course aims to provide the student with advanced skills to use visual applications and software using the Rhino Grasshopper program in architectural drawing and design - or new programs and how to use these programs in the field of architecture and urbanism. The course comprises a combination of lectures devoted to computer programs updated with practical applications on various exercises.

References

1- Linda Holtzschue , Edward Noriega , "Design Fundamentals for the Digital Age", Wiley, 1997-Benjamin,
2- Wucius Wong, "Visual Design on the Computer", W. W. Norton & Company, 2001
3- Hashimoto , Clayton, "Visual Design Fundamentals", Course Technology PTR, 2009

ARC421 Computer Applications in Environmental Control (1,3,0)

The course aims to provide the student with advanced skills to use the applications of environmental control programs and to clarify how to control environmental factors as an integral part of architectural design using digital simulations of climate, weather, humidity, solar radiation, wind, heat gain and loss and air movement in and out of voids in the building, a digital study of the effect of those environmental factors on the design The course examines the means and methods of protection from climate influences and the foundations of architectural treatments (building form, orientation, natural ventilation of buildings, building materials, openings) by the digital simulation. The course comprises a combination of lectures devoted to computer programs updated with practical applications on various exercises.

References

1- Linda Holtzschue , Edward Noriega , "Design Fundamentals for the Digital Age", Wiley, 1997-Benjamin,
2- Wucius Wong, "Visual Design on the Computer", W. W. Norton & Company, 2001
3- Hashimoto , Clayton, "Visual Design Fundamentals", Course Technology PTR, 2009

ARC422 Geographic information systems (GIS) (1,3,0)

The course aims to provide the student with advanced skills for using software applications that are concerned with spatial descriptive databases such as geographic information systems and how to use these programs in the field of architecture and urbanism. The course comprises a combination of lectures devoted to computer programs updated with practical applications on various exercises.

References

1- Linda Holtzschue , Edward Noriega , "Design Fundamentals for the Digital Age", Wiley, 1997-Benjamin,
2- Wucius Wong, "Visual Design on the Computer", W. W. Norton & Company, 2001
3- Hashimoto , Clayton, "Visual Design Fundamentals", Course Technology PTR, 2009

ARC423 Building Information Modeling (BIM) (1,3,0)

The course aims to provide the student with advanced skills to use BIM applications and software in architectural drawing and design - or any new programs, such as Autodesk Revit software. The course comprises a combination of lectures devoted to computer programs updated with practical applications on various exercises.

References

1- Linda Holtzschue , Edward Noriega , "Design Fundamentals for the Digital Age", Wiley, 1997-Benjamin,
2- Wucius Wong, "Visual Design on the Computer", W. W. Norton & Company, 2001
3- Hashimoto , Clayton, "Visual Design Fundamentals", Course Technology PTR, 2009

ARC424 Landscape of Parks and Open Spaces (1,3,0)

The course aims to expand students' potentials to design gardens that interact and integrates with the surrounding urban features through garden type's studies of the following elements inside the external space:

- Mobility within the formed space, passage network studies (pedestrians/ service)
- Soft-cape and hard-cape; types, use, design principals and precautions.
- Garden coordination and aesthetic enhancement.
-Local environment aspects and plantation elements effect.

References

1- Austin, R. Designing with Plants, Van nostrand Reinhold Fishman, R. 19 Urban Utopias of the Twentieth Century.
2- Lyall, Sutherland, (1991), Designing the New Landscape, Thames and Hudson
3- Tate, Alan (2003), Great City Parks, Spon Press, 2nd edition
4- Walter Rogers, 1996, The Professionals Practice of Landscape Architecture, John Wiley & Sons.
5- Tim Waterman, 2015, The Fundamentals of Landscape Architecture
6- Steven L. Cantor, 1996, Contemporary Trends in Landscape Architecture, John Wiley & Sons

List (2) of Specialized Elective Courses

ARC425 Contemporary Architectural Trends (2,0,0)

This course aims to introduce students to different trends in contemporary Architecture. Students are encouraged to adjust the course according to their needs in favor of enhancing their architectural knowledge.

References

1- Bruno Zevi, (1978), The Modern Language of Architecture, University of Washington Press
2- Bren C. Brolin, (1976), The Failure of Modern Architecture, Van Nostrand Reinhold Co.
3-Charles Jencks, (1988), Architecture Today, Academy Editions, London
4-Christine killory, (2007), Details in contemporary architecture as built
5-Paul overy (1991), Thames and Hudson ,De Stigl

ARC426 Aesthetics and Architectural Criticism (2,0,0)

This course aims at enhancing students' skills in comprehending the values of aesthetics in architecture as well as developing students' skills in architectural criticism through analysis and synthesis of its form and composition.

References

1- Ghoneim, Omar: philosophy of criticism and artistic taste. Nancy library,(2007 (
2- Farraj, Afaf Ahmed ,the psychology of artistic taste. Cairo: Anglo-Egyptian library.(2005)
3- Reid, Herbert. (1994) Modern Sculpture: A Brief History. (Translation) Khalil Fakhri. Beirut: Arab Institute for Research and Publishing
4- Fisher, Ernest (1989) The need art. (Translation) the happiest Halim. Egypt: Egyptian General Book.

ARC427 Vernacular Architecture (2,0,0)

The course aims to introduce the students to the folk heritage in the field of architecture that the environmental, cultural, circumstances and local building material formed, and the folk methods for environmental control through construction methods and formation that uses local skills without relying on machines and the negative energy.

The course presents the features of ancestor architecture especially the Islamic and that through lectures – seminars – practical research

References

1- Amos Rapoport, House Form and Culture, Foundations of Cultural Geography Series, 1969
2- Hassan Fathy, "Architecture for the poor", An experiment in rural Egypt, University of Chicago Press,1973.
3- Paul Oliver, Dwellings - The House across the World, Phaidon Press Limited.
4- Willi Weber & Simos Yannas, 2013, Lessons from Vernacular Architecture, Routledge
5- Henry Glassie, 2000, Vernacular Architecture, Indiana University Press

ARC428 Furniture Design (2,0,0)

The course aims to provide students with the scientific and practical principles governing the design of contemporary furniture by following the rules of “Ergonomics” / definition of the study of efficiency “Ergonomics”, with the study of some distinct models of Ergonomic designs in contemporary furniture.

References

1- Ernst and Peter Neufert, Architects Data, Recommended books.
2- Time Saver Standards for Architectural Design Data.
3- Wiley, Ramsey Sleeper, (2007) , "Architectural Graphic Standards",11th Edition, American
4- Jim Postell, 2012, Furniture Design, John Wiley & Sons Inc.
5- Jerzy Smardzewski, 2015, Furniture Design, Springer
Marcelo Soares & Francisco Rebelo, 2014, Advances in Ergonomics In Design, Usability & Special Populations

ARC429 Conservation of Heritage Buildings and Districts (2,0,0)

The course aims to provide students with the necessary knowledge and information to understand the importance of heritage in general and heritage buildings in particular. The course deals with the study of international charters and local legislations related to safeguard of heritage buildings, techniques of documentation, the suitable materials, treatment methods and the different degrees of intervention usually applied in heritage conservation projects.

References

1- Alison Henry ,(2015)”Stone Conservation: Principles and Practice Kindle”, Routledge (November 30, 2015) Edition
2- Norman Tyler(2009),” “Historic Preservation: An Introduction to Its History, Principles, and Practice” W. W. Norton & Company; 2nd edition (Second Edition(
3- مهندس عبد المعز شاهين , (2008) " ترميم و صيانة المبانى الاثرية و التاريخيالمجلس الاعلي للاثار-القاهرة
4- اسامة النحاس، " معايير صيانة وترميم الاثار", بحث منشور (2010)

List (3) of Specialized Elective Courses

ARC430 Building Construction Equipment (2,0,0)

The course aims at providing students with the basic knowledge of building equipment as well as their impact in maximizing the implementation performance. Students learn about the different equipment and implementation tools, their capacities, functions and requirements. Student also get acquainted with the technical and scientific approach to select and operate the equipment, learn about the rates of mechanical performance, consumption, operation and maintenance as well as the economics of equipment operation within the various constructions fields. Moreover, students are informed with the site construction management software.

References

1- محمد ماجد خلوصي " الإدارة التنفيذية لمشروعات التشييد والتحكم في التكلفة والوقت"
2- توفيق عبد الجواد - م.محمد توفيق عبد الجواد - مواد البناء وطرق الإنشاء في المباني-دار النهضة 1998
3- Project Management Institute, (2013), "A Guide to the Project Management Body of Knowledge", Project Management Institute; 5 edition

ARC431 Project Management (2,0,0)

This course aims to inform students with the essentials of the modern construction management techniques that rely on maximizing the performance efficiency of the various construction projects in various phases. The objective of the course is achieved by exploring the following; efficient planning and organizational framework, section analysis, coordination of implementation disciplines, methods and techniques of monitoring and evaluations, Critical Path Method (CPM). The course addressed factors to improve the execution performance of the project. The course provides students with the basic knowledge for construction management starting from the conceptual design till the actual implementation phase. Students understands various management tasks during each phase, such as planning and implementation schedules and resource management, as well as methods for follow up and supervision of cost, expenses and execution time within the framework of the basics of value engineering.

References

1- Harold R. Kerzner, (2013), “Project Management: A Systems Approach to Planning, Scheduling, and Controlling", Wiley; 11 edition .
2- Terry Schmidt, (2009), “Strategic Project Management Made Simple: Practical Tools for Leaders and Teams”, Wiley; 1 edition .
3- Project Management Institute, (2013), "A Guide to the Project Management Body of Knowledge", Project Management Institute; 5 edition .
4- Meredith, R. Jack and Mantel, Jr., Samuel J., (2008), "Project Management: A Managerial Approach ,"Wiley, 7th edition.
5- Project Management Institute, (2013), "A Guide to the Project Management Body of Knowledge", Project Management Institute; 5 edition

ARC432 Building and Construction Insurance (2,0,0)

The course material helps to deepen the students understanding how to secure the buildings and construction operations to reach the production to the required safety level. And that through studying the factors that effect in the building security after and through construction such as: Fire – explosions – earthquakes – material and liquid leakage – soil properties risks – structure elements – execution procedure and safety precautions – methods and safety accomplishment techniques

References

1- الكود المصري لأسس التصميم واشتراطات التنفيذ لحماية المنشآت من الحريق واشتراطات الدفاع المدني
2- الكود المصرى لحساب الاحمال والقوى فى الاعمال الانشائية واعمال المباني
3- Bernard Klaene & Russell Sanders, 2007, Structural Firefighting: Strategy and Tactics, Jones and Bartlett Publishers
4- David M. McGrail, 2007, Firefighting Operations in High-Rise and Standpipe-Equipped Buildings, PenWell Corporation

ARC433 Integrated Architecture (2,0,0)

The course aims to set integrated architecture as a design style from which facilities preparation and communication and control equipment and alarm, and what is needed from design procedures and the course contains the fundamentals of using modern technology in building preparation and communication network and the ventilation of the architectural design to attend to the needs of the equipment. Taking in consideration the principles of value engineering. The teaching includes lectures – site visit – and data analysis

References

1- Derek Osbourn &Reger Greeno, Mitchell's Building Construction, B.T Batsford Ltd, 2007.
2- Joseph De Chiara, Time Saver for Interior Design and Space Planning, McGraw-Hill, 1991
3- Encyclopedia of Building Technology (Farouk Haider)
4- Ed van Hinte, 2003, Smart Architecture
5- James M Sinopoli, 2009, Smart Buildings Systems for Architects, Owners and Builders, Butterworth Heinemann Books

ARC434 Environmental Impacts of Projects (2,0,0)

The course teaches environment natural risks evaluation (geological – climatic), and the economic and social factors in an environmental frame, in addition to ways and methods to evaluate the environment risks, the values and types of pollution sources, the cost analysis procedure, and the environmental return of the projects, and the environment and urban harmony, the fundamental of ecological environmental planning, the environmental risks in Egypt.

References

1- Daniel E. Williams, 2007, Sustainable Design: Ecology, Architecture, and Planning, John Wiley & Sons, Inc.

2- Moore, F., Environmental control systems, Heating Cooling – Lighting, McGraw-Hill Inc., 1993 .
3- Olgyae V, Design with Climate – Bioclimatic Approach to Architecture Regionalism, Princeton University press, 1973
4- Lechner, N., Heating, Cooling, Lighting- Design Methods for Architects, John Wiley &Sons, 1991

5- دليل العمارة والطاقة " العمارة الخضراء والطاقة" جهاز تخطيط الطاقة – يوليو 1998م.
6- شفق العوضى الوكيل، د.م محمد عبد الله سراج " المناخ وعمارة المناطق الحارة" القاهرة 1989.
7- 4- خالد الفجال "العمارة والبيئة فى المناطق الصحراوية" الدار الثقافية للنشر والتوزيع - 2002

LIST OF ELECTIVE COURSES FROM UNIVERSITY REQUIREMENTS

GEN900 Communication & Presentation Skills (1,1,0)

General introduction to communication, the importance of communication, types of communication, communication barriers, listening skills, attributes and methods of reading, verbal communication: speaking and writing skills, non-verbal communication, dialogue skills and strategies of persuasion, communication in the work environment, writing CVs, reports and official letters.

References:

1- Gary Johns and Alan M. Saks, Organizational Behavior, Addison Wesley Longman, 2009.
2- Scgermerhorn, Jr., R. J., Hunt, G. J., and Osborn, N. R., Organizational Behavior, John Wiley & Sons, Inc., New York, 10th. Ed., 2008.

GEN901 Theory of Sustainability (1,1,0)

The course aims to introduce students to the concept of sustainability and its feasibility in order to develop its capabilities to reach architectural applications that contribute to achieving the goals of sustainability and its usefulness and to clarify the risks of unsustainable environment. The course deals with the components of the natural environment and the factors of preserving its components and equilibrium, the biological system, cycles and ecological chains, the presence characteristics of natural resources, energy and biological systems. Rapid development of sustainability applications and their comprehensiveness based on modern means of communication and digital technologies.

References:

1- Perspectives for a New Social Theory of Sustainability, Mariella Nocenzi and Alessandra Sannella, Springer Nature Switzerland 2020 .

GEN902 Human Rights and Combating Corruption (1,1,0)

Human rights: general introduction, definition of human rights, characteristics and principles of human rights, general rules of the idea of human rights, historical development of the idea of human rights, types of human rights, individual rights, collective rights (people's rights), sources of human rights, legal system of rules of protection Human rights, human rights according to the Egyptian constitution in 2014, the duties and obligations of individuals in society. Combating corruption: definition of corruption, its causes, effects and characteristics, types of corruption and its causes, the impact of corruption on human rights and development, the impact of corruption on economic rights and sustainable development, criminal confrontation of corruption.

References:

1- Peter Joseph , The New Human Rights Movement: Reinventing the Economy to End Oppression, Inc. Blackstone Audio: Books, 2017

GEN903 Research and Analysis Skills (1,1,0)

Scientific thinking and its characteristics, definition of scientific research and its characteristics, steps of scientific research (selection of the subject of research, determine the problem of research and selection factors, determine the framework of research, determine the method of research, data analysis), types of scientific studies: exploratory studies, descriptive studies, experimental studies . Methods of scientific research: descriptive approach, social survey, content study, content analysis. Data collection tools: Metrics, observation, interview, questionnaire. Data presentation and analysis methods: Descriptive methods, deductive methods.

References:

1- Gary Johns and Alan M. Saks, Organizational Behavior, Addison Wesley Longman, 2009.
2- Scgermerhorn, Jr., R. J., Hunt, G. J., and Osborn, N. R., Organizational Behavior, John Wiley & Sons, Inc., New York, 10th. Ed., 2008.

GEN904 Entrepreneurship (1,1,0)

Concepts in Entrepreneurship, Entrepreneurship and Small Enterprises, Generating Ideas for Entrepreneurial Projects, University and Entrepreneurship Opportunities and Challenges, Marketing Plan, Operational Plan, Financial Plan, Business Plan Writing, Technological Environment of Entrepreneurship, External Business Environment of Entrepreneurial Projects, Support Programs for Leading Projects Egyptian Economy, Entrepreneurial Project Presentation Skills.

References:

1- Entrepreneurship: An Evidence-Based Guide by Robert A Baron Edward Elgar Pub., 2012.

GEN905 Professional Ethics (1,1,0)

The course provides the background needed to discuss the core topics of engineering ethics, with a focus on the ethical issues facing engineers in the areas of engineering work in companies. The course includes the definition of the general elements of the ethics of the profession and the observance of the public interest and regulations and regulations, obligations to the community, the responsibilities of engineers, disclosure of violations, behavior, basic principles and codes of the ABET code of conduct of engineers.

References:

1- William Frey, Professinnal Ethics in Engineering, November, 2013, http://cnx.org/content/col10399/1.4/

GEN906 Critical Thinking (1,1,0)

Theoretical concepts (memory, thinking, creativity), an introduction to the thinking skills, the nature of thinking (definition, characteristics, levels), types of thinking (creative, critical, scientific), cognitive thinking skills, meta-cognitive thinking skills, thinking measurement tools, strategies Used in the development of thinking skills, programs to teach thinking skills, methods of teaching thinking skills.

References:

1- Critical Thinking: A Beginner's Guide to Critical Thinking, Better Decision Making and Problem Solving Paperback, by Jennifer Wilson,, Create Space Independent Publishing Platform 2017.

GEN907 Human Resources Management (1,1,0)

Historical development of human resources management, key functions of human resources management, human resources planning, access to human resources, training and development of human resources, compensation of human resources, human resource conservation.

References:

1- Human Resource Management, University of Minnesota Libraries Publishing, 2016

GEN908 Contracts and Legislation (1,1,0)

The course aims to provide the student with the technical and legislative knowledge related to the practice of the profession. The study of building legislation, urban planning and the laws governing the practice of the profession and the work systems (engineer / owner / contractor / ...) at the local and international levels as well as studying the methods of contracting/rules and systems for the preparation of integrated implementation documents. Tenders and methods of their examination and evaluation.

References:

1- Randall S. Schuler, Susan E. Jackson, Strategic Human Resoure Management , Wiley, 2nd ed., 2007.
2- Lewicki, J. R., Saunders, M. D., and Barry, B., Essentials of Negotiation, McGraw - Hill, 5th. Ed., 2011.

GEN409 Methods of Scientific Research & Writing (2,2,0)

The course aims to develop the student's abilities to conduct applied scientific research in one of the areas proposed for the graduation project within a group research team while following the scientific research steps to get conclusions. Where the elements and components of scientific research are identified: the research problem, the methodology for solving problems and the basic differences between the different scientific research approaches, methods of data gathering and statistics needed for the research, as well as, learning the methods of examining and analyzing data and information and scientific dealing with variables, formulating research hypotheses, methods of discussing and examining hypotheses. Moreover, study the methods and means of conclusion through the study and application of the scientific method to write integrated scientific research. Thus, students select one of the architectural, urbanism, or technical fields problems - previously presented as a basis for the graduation project - to conduct the necessary scientific research for it, and the students are asked to submit - within a research group - a written scientific thesis that includes the research stages, its elements, conclusions and recommendations on the topic of the graduation project. In the end, the student is discussed orally by an examining committee to evaluate the student's performance - within his group - and his studies, analyzes, conclusions and recommendations regarding the proposed graduation project program. **References**

1- Research Methodology and Scientific Writing, by C. George Thomas, Ane Books Pvt. Ltd., 2016
2- Williamson, Antony Ford, Understanding Scientific Research ,Taylor & Francis, 2013
3- Garnier J. Principles and Practice of research , Presses univ. de Louvain, 2011
4- بدر احمد ، أصول البحث العلمى ومناهجه ، المكتبة الاكاديمية 1996
5- مبارك محمود الصاوى ، البحث العلمى ، اسسه وطريقة كتابته ، المكتبة الاكاديمية 1992