PROGRAM SPECIFICATIONS (2010-2011)

Mechanical Eng. Department  Faculty of Engineering at Shoubra  Benha University

Mechanical Engineering Department  
Production and Mechanical Design Program  
2010-2011

A-Basic Information

(1) Program Title:  Production and Mechanical Design Program  
(2) Program Type:  Single  
(3) Department:  Mechanical Engineering  
(4) Coordinator:  Prof. Dr. Maher Higazy  
(5) External evaluator:  Prof. Dr Yahya El Mashed by the faculty council on 21/9/2010  
(6) Last date of program specifications approval:  faculty council on 10/05/2006

B-Professional Information

1. Program aims

The mission of the production and mechanical design program is to provide students with a broad and thorough education in production engineering fundamentals, applications, and design so as to prepare graduates for the practice of mechanical engineering at the professional level with confidence and skills necessary to meet the technical and social challenges of the future and for continuing their studies at the graduate level.

In pursuit of this mission, the educational objectives of the production and mechanical design program are:

- To provide a broadly based educational experience in which the essential scientific and technical elements of the engineering curriculum are integrated with the humanities and social sciences to prepare students with competencies needed for personal enrichments, career development, and lifelong learning.
- To ensure that the graduates have an understanding of the highest standards of personal and professional integrity, and ethical responsibility in the practice of mechanical engineering.
- To ensure that the graduates are well trained in several areas of mechanical engineering.
- To ensure the ability of students in defining, analyzing and solving a wide range of mechanical engineering problems using modern tools and techniques.
- To provide students with a major design experience involving a team approach and alternate solutions, and incorporating realistic constraints that include economic, environmental, ethical, safety, social, and political considerations.

According to the National Academic Reference Standard, the production and mechanical design program must satisfy the following Learning Outcomes.
2. Intended Learning Outcomes (ILOs)

a. Knowledge and understanding:

Graduates of the production and mechanical design program will achieve an appropriate level of technical competence in acquiring knowledge and understanding of:

a.1) Concepts and theories of mathematics and sciences, appropriate to the discipline.
a.2) Basics of information and communication technology (ICT).
a.3) Characteristics of engineering materials related to discipline.
a.4) Principles of design including elements design, process and/or a system related to specific disciplines.
a.5) Methodologies of solving engineering problems, data collection interpretation.
a.6) Quality assurance systems, codes of practice and standards, health and safety requirements and environmental issues.
a.7) Business and management principles relevant to engineering.
a.8) Current engineering technologies as related to disciplines.
a.9) Topics related to humanitarian interests and moral issues.
a.10) Technical language and report writing.
a.11) Professional ethics and impacts of engineering solutions on society and environment.
a.12) Contemporary engineering topics.
a.13) Concepts, principles and theories relevant to Mechanical Engineering and manufacture;
a.14) The constraints within which his/her engineering judgment will have to be exercised;
a.15) The specifications, programming and range of application of CAD and CAD/CAM facilities
a.16) Relevant contemporary issues in mechanical engineering.
a.17) Basic electrical, control and computer engineering subjects related to the discipline
a.18) The role of information technology in providing support for mechanical engineers
a.19) Engineering design principles and techniques.
a.20) Management and business techniques and practices appropriate

b. Intellectual skills

The Mechanical engineering graduate should be able to:

b.1) Select appropriate mathematical and computer-based methods for modeling and analyzing problems.
b.2) Select appropriate solutions for engineering problems based on analytical thinking.
b.3) Think in a creative and innovative way in problem solving and design.
b.4) Combine, exchange, and assess different ideas, views, and knowledge from a range of sources.
b.5) Assess and evaluate the characteristics and performance of components, systems and processes.
b.6) Investigate the failure of components, systems, and processes.
b.7) Solve engineering problems, often on the basis of limited and possibly contradicting information.
b.8) Select and appraise appropriate ICT tools to a variety of engineering problems.
b.9) Judge engineering decisions considering balanced costs, benefits, safety, quality, reliability, and environmental impact.
b.10) Incorporate economic, social, environmental dimensions and risk management in design.
b.11) Analyze results of numerical models and appreciate their limitations.
b.12) Create systematic and methodic approaches when dealing with new and advancing technology.
b.13) Apply the principles of mathematics, science and technology in problem solving scenarios in mechanical engineering;
b.14) Analyze and interpret data, and design experiments to obtain primary data.
b.15) Evaluate and appraise designs, processes and products, and propose improvements;
b.16) Interpret numerical data and apply analytical methods for engineering design purposes
b.17) Use the principles of engineering science in developing solutions to practical mechanical engineering problems.
b.18) Select appropriate manufacturing method considering design requirements.

c. Practical and Professional skills

The mechanical engineering graduates must show ability to:
c.1) Apply knowledge of mathematics, science, information technology, design, business context and engineering practice to solve engineering problems.
c.2) Professionally merge the engineering knowledge, understanding, and feedback to improve design, product and/or services.
c.3) Create and/or re-design a process, component or system, and carry out specialized engineering designs.
c.4) Practice the neatness and aesthetics in design and approach.
c.5) Use computational facilities and techniques, measuring instruments, workshops and laboratories equipment to design experiments, collect, analyze, and interpret results.
c.6) Use a wide range of analytical tools, techniques, equipment, and software packages pertaining to the discipline and develop required computer programs.
c.7) Apply numerical modeling methods to engineering problems.
c.8) Apply safe systems at work and observe the appropriate steps to manage risks.
c.9) Demonstrate basic organizational and project management skills.
c.10) Apply quality assurance procedures and follow codes and standards.
c.11) Exchange knowledge and skills with engineering community and industry.
c.12) Prepare and present technical reports.
c.13) Prepare engineering drawings, computer graphics and specialized technical reports and communicate accordingly.
c.14) Employ the traditional and modern CAD and CAD/CAM facilities in design and production processes

c.15) Use basic workshop equipment safely;

c.16) Analyze experimental results and determine their accuracy and validity;

c.17) Use laboratory equipment and related computer software;

c.18) Operate and maintain mechanical equipment.

c.19) Prepare the process plan for manufacturing.

d. General and transferable skills

Graduates will have an educated view of the world including:

d.1) Collaborate effectively within multidisciplinary team.

d.2) Work in stressful environment and within constraints.

d.3) Communicate effectively.

d.4) Demonstrate efficient IT capabilities.

d.5) Lead and motivate individuals.

d.6) Effectively manage tasks, time, and resources.

d.7) Search for information and engage in life-long self learning discipline.

d.8) Acquire entrepreneurial skills.

d.9) Refer to relevant literatures.

3. Academic standards

3.a. Nationally: National Academic References Standards (NARS)

3.b. External references for standards (Benchmarks): (ABET)
The external references for standards considered in the development of this program were the National Academic Reference Standards (NARS) prepared by the engineering education sector of the supreme council of universities in Egypt and those of the American Accreditation Board for Engineering and Technology (ABET).

3.c. Comparison of provision to external references
The following table explains how the attributes of the current program compare to the requirements of the NARS and the ABET criteria for program outcomes and assessment:

<table>
<thead>
<tr>
<th>Attributes of program graduates as per ABET Criterion (3) for program outcomes and assessment</th>
<th>Attributes of program graduates as per NARS Requirements for engineering programs, in general</th>
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</thead>
<tbody>
<tr>
<td>(a) ability to apply knowledge of mathematics, science and engineering</td>
<td>(a) ability to apply knowledge of mathematics, science and engineering concepts to the solution of engineering problems</td>
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<td>(b) ability to design and conduct experiments, as well as to analyze and interpret data</td>
<td>(b) ability to design and conduct experiments as well as analyze and interpret data</td>
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<tr>
<td>(c) ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability</td>
<td>(c) ability to design a system, component, and process to meet the required needs within realistic constraints</td>
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<tr>
<td>(d) ability to function on multidisciplinary teams</td>
<td>(d) ability to work efficiently within multidisciplinary teams</td>
</tr>
<tr>
<td>(e) ability to identify, formulate and solve engineering problems</td>
<td>(e) ability to identify, formulate and solve fundamental engineering problems</td>
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<tr>
<td>(f) understanding of professional and ethical responsibility</td>
<td>(f) ability to display professional and ethical responsibilities; and contextual understanding</td>
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<td>(g) ability to communicate effectively</td>
<td>(g) ability to communicate effectively</td>
</tr>
<tr>
<td>(h) having the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context</td>
<td>(h) ability to consider the impacts of engineering solutions on society and environment</td>
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<tr>
<td>(i) recognition of the need for, and ability to engage in life-long learning</td>
<td>(i) ability to engage in self- and life-long learning</td>
</tr>
<tr>
<td>(j) knowledge of contemporary issues</td>
<td>(j) ability to Demonstrate knowledge of contemporary engineering issues</td>
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<tr>
<td>(k) ability to use the techniques, skills, and modern engineering tools necessary for engineering practice</td>
<td>(k) ability to use the techniques, skills, and appropriate engineering tools necessary for engineering practice and project management</td>
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<td></td>
<td>(l) ability to design robust Mechanical projects with creativity and technical mastery</td>
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<td></td>
<td>(m) ability to investigative skills, attention to details and visualize/conceptualize skills</td>
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<td></td>
<td>(o) ability to adopt historic problem solving approach for complex, ambiguous and open-ended challenges and scenarios</td>
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<td></td>
<td>(p) ability to demonstrate knowledge of cultural diversity, differences and the impact of a building on community character and identity</td>
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<tr>
<td></td>
<td>(q) ability to address urban issues, planning and community needs through design work</td>
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<td></td>
<td>(u) ability to recognize the new role architecture engineer as the leader of design projects- who has the ability to understand, assemble and coordinate all of the disciplines- to create a sustainable environment</td>
</tr>
</tbody>
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4. Curriculum Structure and Contents

4a. Program duration: 10 semesters (5-years)
4b. Program structure: Contact hours system
   4b.i - No. of Contact hours: 300  133 Lectures  167 Tutorial /Exercises
   4b.ii - No. of Contact hours: 288 Compulsory  12 Elective
   4b.iii - No. of Contact hours of basic science: 116 hours =38.8 %
   4b.iv - No. of Contact hours of social science and humanities: 32 hours =11 %
   4b.v - No. of Contact hours of specialized courses: 152 hours = 61.2 %
4c. Indicative curricula Content by Subject Area

Table 1: Indicative curricula content by subject area

<table>
<thead>
<tr>
<th>Subject Area</th>
<th>%</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Humanities and Social Sciences (Univ. Req.)</td>
<td>6.3</td>
<td>9-12 %</td>
</tr>
<tr>
<td>B Mathematics and Basic Sciences</td>
<td>23.4</td>
<td>20-26 %</td>
</tr>
<tr>
<td>C Basic Engineering Sciences (Faculty/Spec. Req.)</td>
<td>22.4</td>
<td>20-23 %</td>
</tr>
<tr>
<td>D Applied Engineering and Design</td>
<td>25.4</td>
<td>20-22 %</td>
</tr>
<tr>
<td>E Computer Applications and ICT*</td>
<td>9.5</td>
<td>9-11 %</td>
</tr>
<tr>
<td>F Projects* and Practice</td>
<td>8.3</td>
<td>8-10 %</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td><strong>95.4</strong></td>
<td><strong>92-94 %</strong></td>
</tr>
<tr>
<td>G Discretionary (Institution character-identifying) subjects</td>
<td>4.6</td>
<td>6-8 %</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Practical/Field Training: the students must carry out 3 weeks of field training after the freshman year and after the sophomore year.