# Model No.12
# Course Specifications: Metal Forming

**University:** Benha University
**Faculty:** Faculty of Engineering at Shoubra
**Department offering the program:** Mechanical Engineering Department
**Department offering the course:** Mechanical Engineering Department

## 1- Course Data

**Course Code:** MDP311 **Course Title:** Metal Forming
**Specialization:** Mechanical Production Engineering **Course Type:** Compulsory **Study Year:** Third Year
**Teaching Hours:** Lecture: 4 Tutorial: 2 Practical: 0 Total: 6

## 2- Course Aim

**For students undertaking this course, the aims are to:**

- The student will understand, the continuum description of stress and strain through metallic materials.
- Studying all the basic theory necessary to understanding of metal working processes
- Understanding detailed consideration of the theories of yielding and an introduction to the concepts of plasticity

## 3- Intended Learning Outcomes of Course (ILO's)

**a. Knowledge and Understanding Skills:** On completing this course, students will be able to:

a- 1 - Explain Stress and strain relationships for elastic behavior, plane stress, state of stress in three dimensions and strain in two dimensions. (A1)

a- 2 - Identify the elastic stress- strain relations. (A3)

a- 3 - Explain the elements of the theory of plasticity: Yielding criteria for ductile metals. & Levey-Mises Equations (Ideal plastic solid), Two dimensional plastic flow – slip line field theory. (A13)

**b. Intellectual Skills:** At the end of this course, the students will be able to:

b- 1 - Represent Mohr's circle and identify stress, strain in two dimensions and three dimensions (B1).

b- 2 - Determine the forging load, rod and wire drawing load from local stress evaluation. (B7)

**c. Practical and Professional Skills:** On completing this course, the students are expected to be able to:

c- 1 - Select the stress on the materials during metal forming: drawing, forging, rolling and extrusion (C1).

c- 2 - Use the two dimensional plastic flow – slip line field theory and yielding criteria for ductile metals. & Levey- Mises Equations (Ideal plastic solid). (C5)

c- 3 - Assess of rod, wire drawing load, close-pass tube drawing, forging, rolling load and extrusion force from local stress evaluation. (C6)

**d. General and Transferable Skills:** At the end of this course, the students will be able to:

d- 1 - Collaborate effectively within the different types of manufacturing operations (D1)

d- 2 - Communicate with recent methods of metal forming(D3)

d- 3 - Acquire entrepreneurial skills (D8)

## 4- Course Contents

| Week no. | Topics |
|---|---|
| 1 | Stress and strain relationships for elastic behavior. |
| 2 | (State of stress in two dimensions (plane stress) – Mohr's circle of stress in two dimensions – State of stress in three dimensions – Mohr's circle in three dimensions) |
| 3 | Description of strain at point. (State of strain in two dimensions (plane stress) |
| 4 | Mohr's circle of strain in two dimensions – State of strain in three dimensions |
| 5 | Elastic stress- strain relations. (calculation of stresses from elastic strain). |
| 6 | Elements of the theory of plasticity |
| 7 | Yielding criteria for ductile metals. & Levey- Mises Equations (Ideal plastic solid) , |
| 9 | Two dimensional plastic flow – slip line field theory. |
| 10 | Determination of drawing load by consideration of stresses. (work formula for homogenous deformation, |
| 11 | determination of rod and wire drawing load from local stress evaluation, determination by stress evaluation of the load for close-pass drawing |
| 12 | Determination of forging load from local stress evaluation. |
| 13 | Determination of rolling load and power |
| 14 | Determination of Extrusion force. & Sheet metal forming. |

## 5- Teaching and Learning Methods

5.1- Lectures
5.2- Class activity
5.3- Case study
5.4- Assignments / homework

## 6- Teaching and Learning Methods of Disables

- Nothing.

## 7- Student Assessment

### a- Student Assessment Methods

1. Assignments to assess knowledge and intellectual skills.
2. Quiz to assess knowledge, intellectual and professional skills.
3. Midterm exam to assess knowledge, intellectual, professional and general skills.
4. Oral exam to assess knowledge and intellectual skills.
5, Final exam to assess knowledge, intellectual, professional and general skills.

**b- Assessment Schedule**

| NO. | Assessment | Week |
|---|---|---|
| 1 | Assignments | 2, 3, 5, 6,9,11 |
| 2 | Quiz | 5,10 |
| 3 | Midterm exam | 8 |
| 4 | Oral exam | 14 |
| 5 | Final exam | 15 |

**c- Weighting of Assessments**

| Assessment | Weight (%) |
|---|---|
| Midterm Examination | 20 |
| Final Term Examination | 60 |
| Oral Examination | 10 |
| Practical Examination | 00 |
| Semester Work | 5 |
| Other Types of Assessment | 5 |
| **Total** | **100** |

## 8- List of References

**a- Course Notes :** 1- Course notes prepared by instructor

b-

**b- Recommended Books**

1-Metal Forming Practice. Processes – Machines – Tools, Translated by Anne Koth (2005)
2- Engineering Material and Their Manufacturing" Dr. Zulqerain Mallic
3- Mechanical Metallurgy" George E. Dieter
4- Metal Forming " Fundamental and applications. Taylon Altan , Soo-ik oh and Harold
5 - Element of Metalworking Theory" Geoffrey W. Row

**Course Coordinator**: Dr. Aziza Amin mohamed sherif

**Head of Department:** Prof. Dr. Osama Ezzat Abdelatif

# Model No.11A
# Course Specifications: Metal Forming

**University:** Benha University
**Faculty:** Faculty of Engineering at Shoubra
**Department offering the program:** Mechanical Engineering Department
**Department offering the course:** Mechanical Engineering Department

## Matrix of Knowledge and Skills of the Course

| no. | Topics | Week no. | Knowledge and Understanding Skills | Intellectual Skills | Practical and Professional Skills | General and Transferable Skills |
|---|---|---|---|---|---|---|
| 1 | Stress and strain relationships for elastic behavior. | 1 | a1 | b2 | | d3 |
| 2 | State of stress in two dimensions (plane stress) | 2 | a2 | b2 | | |
| 3 | Description of strain at point. State of strain in two-dimension dimension. dimensions (plane stress) | 3 | a3 | | c2 | |
| 4 | Mohr's circle of strain in two dimensions. | 4 | | b1 | | d1 |
| 5 | Elastic stress- strain relations. | 5 | | b2 | | d2 |
| 6 | Elements of the theory of plasticity | 6 | a1 | | | d3 |
| 7 | Yielding criteria for ductile metals. & Levey- Mises | 7 | | b1 | c1 | |
| 8 | **Midterm exam** | 8 | | | | |
| 9 | Two dimensional plastic flow – slip line field theory. | 9 | a2 | | c3 | d3 |
| 10 | Determination of drawing load by consideration of stresses. | 10 | | b1 | | d1 |
| 11 | determination of rod and wire drawing load from local stress | 11 | a 1 | | | d2 |
| 12 | Determination of forging load from local stress evaluation. | 12 | a2 | | c 2 | |
| 13 | Determination of rolling load and power | 13 | | b 2 | c3 | |
| 14 | Determination of Extrusion force. & Sheet metal forming. | 14 | | b2 | c2 | |
| 15 | **Final exam** | | | | | |

**Course Coordinator**: Dr. Aziza Amin mohamed Sherif

**Head of Department:** Prof. Dr. Osama Ezzat Abdelatif

# Matrix of Course Aims and ILO's

**Course Title:** Metal Forming

**Course Code:** MDP341

**Teaching Hours:** Lecture: 4 Tutorial: 2 Total: 6

**Major or minor element of program:** Major

**Program on which the course is given:** B.Sc. Mechanical Production Engineering

**Department offering the program:** Mechanical Engineering Department

**Department offering the course:** Mechanical Engineering Department

**Academic year / level:** 2014-2015 Third Year / First Semester

**Date of specifications approval:** 2014

| Course aims | Basic Knowledge | Intellectual skills | Professional skills | General skills |
|---|---|---|---|---|
| The student will understand, the continuum description of stress and strain through crystalline | a1, a3 | b1 | | d1 |
| Studying all the basic theory necessary to understanding of metal working processes | a1, a3 | b2 | c1, c2 | d1, d2 |
| Understanding detailed consideration of the theories of yielding and an introduction to the concepts of plasticity | a2 | b3 | c2, c3 | d3 |

**Course Coordinator**: Dr. Aziza Amin mohamed sherif

**Head of Department:** Prof. Dr. Osama Ezzat Abdelatif