



**BENHA UNIVERSITY**



**FACULTY OF ENGINEERING AT SHOUBRA**

**Model No.12**  
**Course Specifications (2014-2015)**  
**Materials Science and Metallurgy**

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**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:** MDP123

**Specialization:** Mechanical Production Engineering

**Teaching Hours:** Lecture: 2

**Course Title:** Materials Science and Metallurgy

**Course Type:** Compulsory

Tutorial/ Practical: 2

**Study Year:** First year

Total: 4

**2- Course Aim**

For students undertaking this course, the aims are to:

1. Provide the students with the basics knowledge and skills in material science and engineering.

**3- Intended Learning Outcomes of Course (ILO'S)**

**a- Knowledge and Understanding skills:**

On completing this course, students will be able to demonstrate the knowledge and understanding of:

- a1) The concepts of materials science & engineering related to the mechanical engineering. (A.1)
- a2) The characteristics of engineering materials related mechanical engineering. (A.3)
- a3) The methodologies of solving engineering materials problems. (A.5)

**b- Intellectual Skills**

At the end of this course, the students will be able to:

- b.1) Choice of the suitable solutions for engineering material problems. (B.2)
- b2) Combine and assess different ideas and knowledge of heat treatment of steels & non-ferrous alloys. (B.4)

**c- Practical and Professional Skills**

On completing this course, the students are expected to be able to:

- c.1) Apply knowledge of physics and materials engineering to solve engineering material problems. (C.1)
- c.2) Combine the engineering knowledge to improve properties of engineering materials. (C.2)
- c.3) Use materials standards for choosing suitable materials. (C10)

**d- General Skills**

At the end of this course, the students will be able to:

- d.1) Collaborate effectively within multidisciplinary team. (D1)
- d.2) Communicate effectively. (D.3)
- d.3) Effectively manage tasks, time, and resources. (D.6)



#### 4- Course Contents

Week no.	Topics
1	Introduction to engineering materials.
2	Crystal structure
3	Materials Characterization using X-ray diffraction
4	Solid Solutions
5	Binary phase diagram -1
6	Binary phase diagram -2
7	Iron-Carbon phase diagram
8	Deformation of a single crystal (Advanced)
9	Strengthening mechanisms (Basic)
10	Heat treatment of metals (Ferrous alloys)
11	Heat treatment of metals (Non-Ferrous Alloys)
12	Study of ferrous alloys
13	Study of nonferrous alloys

#### 5- Teaching and Learning Methods

- 5.1- Lectures
- 5.2- Class activity/Tutorial
- 5.3- Assignments/homework.

#### 6- Teaching and Learning Methods of Disables

- Nothing

#### 7- Student Assessment

##### a- Student Assessment Methods

1. Four assignments to assess knowledge and intellectual skills.
2. Three quizzes to assess knowledge, intellectual and professional skills.
3. Mid-term 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, 4, 6, 9
2	Quizzes	5, 7, 10
3	Mid-term exam	8
4	Oral Exam	14
5	Final exam	15



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**c- Weighting of Assessments**

<b>Assessment</b>	<b>Weight</b>
Mid-Term Examination	20 %
Final-Term Examination	60 %
Oral Examination	10%
Semester work	10%
<b>Total</b>	<b>100 %</b>

**8- List of References**

**a- Course Notes**

- 1- Course notes prepared by instructor.

**b- Books**

1. Materials Science and Engineering (An Introduction), William D. Callister, 7<sup>th</sup> edition.
2. Fundamentals of Materials Science and Engineering, William F. Smith and Javad Hashemi, 4th edition, 2006, McGraw Hill.

**C- Web Sites**

- ASME.com
- ASTM.com
- ISO.com

**Course Coordinator:** Prof. Dr. Tarek Khalifa & Prof. Dr. Fouad Helmy Sayed

**Head of Department:** Prof. Dr./ Osama Ezzat Abdullatif



BENHA UNIVERSITY



FACULTY OF ENGINEERING AT SHOUBRA

### Model No.11A

## Course Specifications: Materials Science and Metallurgy

**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	Basic Knowledge	Intellectual Skills	Professional Skills	General Skills
1	Introduction to engineering materials.	1	a1, a3	b2	c1	
2	Crystal structure	2	a2, a3,a5	b1, b2	c1	
3	Materials Characterization using X-ray diffraction	3	a1,a5	b2,b4	c2	
4	Solid Solutions	4	a1,a3	b4 ,b2	c1, c2	
5	Binary phase diagram -1	5	a3 a1,a5	b2	c1	d1
6	Binary phase diagram -2	6	a3	b4 ,b2	c1	d1, d2
7	Iron-Carbon phase diagram	7	a2, a1,a5	b4 ,b2	c1, c2,c10	
8	Midterm Exam	8				
9	Deformation of a single crystal (Advanced)	9	a3 ,a1,a5	b4 ,b2	c1	d1
10	Strengthening mechanisms (Basic)	10	a3 ,a1,a5	b4 ,b2	c1	d1
11	Heat treatment of metals (Ferrous alloys)	11		b2	c1	d3,d6
12	Heat treatment of metals (Non-Ferrous Alloys)	12	a3,a5	b2	c1	d3,d6
13	Study of Ferrous alloys	13	a3,a5	b2	c2, c1 ,c10	d3,d6
14	Study of Non-Ferrous Alloys	14	a3,a5	b2	c2, c1 ,c10	d3,d6
15	Final Exam	15				

**Course Coordinator:** Prof. Dr. Tarek Khalifa & Prof. Dr. Fouad Helmy Sayed

**Head of Department:** Prof. Dr / Osama Ezat Abd Ellatif



### Matrix of course aims and ILO's

**Course Title:** Materials Science and Metallurgy

**Course Code:** MDP123

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

**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 First Year / Second semester

**Date of specifications approval:** 2014

Course aims	Basic Knowledge	Intellectual Skills	Professional Skills	General Skills
Provide the students with the knowledge and skills of material science and engineering	a1, a3, a5	b2, b4	c2, c1, c10	d1, d3, d6

**Course Coordinator:** Prof. Dr. Tarek Khalifa & Prof. Dr. Fouad Helmy Sayed

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