



BENHA UNIVERSITY



FACULTY OF ENGINEERING AT SHOUBRA

COURSE SPECIFICATIONS (2014-2015)

Model No.12

Course Specifications: Heat & Surface Treatment

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: MDP355

Course Title: Heat & Surface Treatment

Specialization: Mechanical Production Engineering

Course Type: Elective

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:

1. Understand the fundamentals of the heat treatment and surface treatment processes.
2. Solve process/product problems where heat treatment is involved in the manufacturing ferrous and non-ferrous industry.
3. Design and implement correct heat treatment processes.

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

a- Knowledge and Understanding

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

- a.1) Techniques used in heat treatment & surface treatment. (A1)
- a.2) The basic principles of Annealing, Normalizing, Hardening, Tempering, Mar-tempering (mar-quenching), Aus-tempering, Solution treatment, Natural ageing, Artificial ageing, Over ageing. (A4)
- a- 3) The basic principles of Case hardening, Carburizing, Carbo-Nitriding, Cyaniding, Nitriding , Boronizing. (A8)
- a- 4) The effect of varying the key parameters on the heat treatment & surface treatment. (A11)
- a- 5) The principles of heat treatment & surface treatment. (A3)

b- Intellectual Skills

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

- b-1) Assess the differences between different types of Heat treatment & surface treatment. (B6)
- b-2) Compare between the different types of Heat treatment & surface treatment. (B8)
- b-3) Analyze the effect of heat & surface treatment. (B1)

c- Professional Skills

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

- c-1) Sketch schematic and accompanying diagrams for different phase diagrams. (C3)
- c-2) Sketch schematic for furnaces used in heat treatment & surface treatment. (C5)
- c-3) Use the property data table and charts for the key points of heat treatment & surface treatment. (C14)



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d- General Skills

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

- d- 1 - Communicate effectively. [D1]
- d- 2- Demonstrate efficient IT capabilities. [D3]
- d- 3 - Search for information and engage in life-long self-learning. [D6]

4- Course Contents

Week no.	Topics
1	General aspects of heat treatment.
2	The use of heat treatment to produce required metallurgical properties.
3	Classification of Steels.
4	Heat treatment of steels.
5	Case hardening, Carburizing, and Nitriding, De-carburizing, Re-heat treatment, Re-tempering, Annealing, and Normalizing.
6	Heat treatment of Aluminum alloys.
7	Annealing, Solution treatment, Hardenability, Strength, and Toughness.
8	Surface Treatment, Coating, Cleaning.
9	Mechanical hardening of the surface.
10	Thermal spraying.
11	Vapor deposition.
12	Applications.

5- Teaching and Learning Methods

- 5.1 Lectures
- 5.2 Tutorial
- 5.3 Class activity
- 5.4 Case study
- 5.5 Seminar

6- Teaching and Learning Methods of Disables

- 4. Nothing.

7- Student Assessment

a- Student Assessment Methods

- 1. Five Assignments to assess knowledge and intellectual skills.
- 2. Two quizzes to assess knowledge, intellectual and professional skills.
- 3. Midterm exam to assess knowledge, intellectual, professional and general skills.
- 4. Final exam to assess knowledge, intellectual, professional and general skills.

b- Assessment Schedule

NO.	Assessment	Week
1	Assignments	3, 5, 7, 10, 11
2	Quiz	4, 9
3	Midterm exam	8
4	Oral exam	-
5	Final exam	15



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c- Weighting of Assessments

Assessment	Weight (%)
Midterm Examination	20
Final Term Examination	67
Oral Examination	-
Semester Work	8
Other Types of Assessment	5
Total	100

8- List of References

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

b- Recommended Books

- Practical Heat Treating, Materials Engineering Institute, ASM International, 1995.
- G. Krauss, Steels: Processing, Structure, and Performance, ASM International, 2005.

Course Coordinator: Prof. Dr. Hamdy Qandil

Head of Department: Prof. Dr. Osama Ezzat Abdelatif



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FACULTY OF ENGINEERING AT SHOUBRA

COURSE SPECIFICATIONS (2014-2015)

Model No.11A

Course Specifications: Heat & Surface Treatment

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	General aspects of heat treatment.	1	a1, a2		c1	
2	The use of heat treatment to produce required metallurgical properties.	2	a4	b2	c1	d2
3	Classification of Steels.	3	a5	b3		
4	Heat treatment of steels.	4		b1	c3	
5	Case hardening, Carburizing, and Nitriding, De-carburizing, Re-heat treatment, Re-tempering, Annealing, and Normalizing.	5	a6	b2		d1
6	Heat treatment of Aluminum alloys.	6		b1	c2	
7	, Annealing, Solution treatment, Hardenability, Strength, and Toughness.	7	a5	b1	c1	
8	Midterm exam.	8				d2
9	Surface Treatment, Coating, Cleaning.	9	a3	b1		
10	Mechanical hardening of the surface.	10		b2	c1	
11	Thermal spraying.	11	a4			d2
12	Vapor deposition.	12	a4	b3	c2	
13	Applications	13	a6	b2		d1
14	Applications	14	a2			d3
15	Final exam	15				
16	Final exam	16				

Course Coordinator: Prof. Dr. Hamdy Qandil

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Matrix of Course Aims and ILO's

Course Title: Heat & Surface Treatment

Course Code: MDP355

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 / Second semester

Date of specifications approval: 2014

Course aims	Basic Knowledge	Intellectual Skills	Professional Skills	General Skills
Understand the fundamentals of the heat treatment and surface treatment processes.	a1, a3	b1 , b2	c2	d1
Solve process/product problems where heat treatment is involved in the manufacturing ferrous and non- ferrous industry.	a2, a3	b2	c1	d2
Design and implement correct heat treatment processes.	a3, a5	b3		

Course Coordinator: Prof. Dr. Hamdy Qandil

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