Model No.12
Course Specifications: Polymer and Composites

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: MDP351 **Course Title:** Polymer and Composites

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 polymers and composites structure, forming techniques and application.
2. Solve process/product problems related to the manufacturing of polymer and composites materials.

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:

a.1) Terminologies used in engineering materials related to Polymer and Composites materials. (A.3).
a.2) The basic principles of the molecular weight, Polymer chain length, Monomer, polymer, crystallinity and amorphous materials. (A4)
a.3) The operating principles of Commercial approaches and considerations of Synthesis of polymers. (A9)
a.4) Steps to approach design problem solution (A5).
a.5) The mechanical behavior, testing, and manufacturing properties of polymer and composites materials. (A16)

b. Intellectual Skills: At the end of this course, the students will be able to:
b.1) Assess the differences between different types of Polymer and Composites materials. (B6)
b.2) Compare between the different types of polymer and composites materials. (B8)
b.3) Analyze the effect of Polymer and Composites materials. (B1)

c. Practical and Professional Skills: On completing this course, the students are expected to be able to:
c.1) Create and/or re-design a process, component or system, and carry out specialized engineering designs related to Polymer and Composites (C.2).

c.2) Exchange knowledge and skills with engineering community and industry (C.1).
c.3) Write computer programs pertaining to Polymer and Composites materials (C.7).

d. General and Transferable Skills: At the end of this course, the students will be able to:
d.1) Work within a team (D.1).
d.2) Communicate successfully (D.3).
d.3) Successfully manage tasks, time, and resources (D.6).

4- Course Contents

No.	Topics
1	Introduction
2	Polymerization Mechanisms
3	Chemical Bonding and Polymer Structure
4	Thermal Transitions in Polymers
5	Polymer Modification
6	Condensation (Step-Reaction) Polymerization
7	Chain-Reaction (Addition) Polymerization
8	Introduction: Applications, advantages and challenge of composites
9	Miscellaneous Aspects of Analysis of Laminated Structures
10	Miscellaneous Aspects of Analysis of Laminated Structures
11	Laminate Bolted and Bonded Joints
12	Laminate Bolted and Bonded Joints
13	Analysis of Discontinuous Fiber-Reinforced Composites

5- Teaching and Learning Methods

5.1- Lectures
5.2- Tutorials
5.3- Class activity
5.4- Case study
5.5- 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. Two quizzes to assess knowledge, intellectual and professional skills.
3. Midterm exam to assess knowledge, intellectual, professional and general skills.
5, Final exam to assess knowledge, intellectual, professional and general skills.

b- Assessment Schedule

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

c- Weighting of Assessments

Assessment	Weight (%)
Midterm Examination	20
Final Term Examination	67
Oral Examination	0
Practical Examination	0
Semester Work	8
Other Types of Assessment	5
Total	**100**

8- List of References

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

b- Recommended Books

1. Materials Science and Engineering (An Introduction), William D. Callister, 7th edition.
2. Fundamentals of Materials Science and Engineering, William F. Smith and Javad Hashemi, 4th edition, 2006, McGraw Hill.
3. Rudin, A., The Elements of Polymer Science and Engineering, Academic Press, New York, 1982.
4. Flory, P.J., Principles of Polymer Chemistry, Cornell University Press.

Course Coordinator:

Head of Department: Prof. Dr. Osama Ezzat Abdelatif

Model No.11A
Course Specifications: Polymer and Composites

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	Introduction	1	a1,a3,a4	b2		
2	Polymerization Mechanisms	2	a3	b1		
3	Chemical Bonding and Polymer Structure	3	a1,a4	b3		
4	Thermal Transitions in Polymers	4		b1,b3		
5	Polymer Modification	5	a4,a5		c1	d2
6	Condensation (Step-Reaction) Polymerization	6		b3		d3
7	Chain-Reaction (Addition) Polymerization	7		b1	c4	d1
8	Introduction: Applications, advantages and challenge of	9	a1,a3	b2		
9	Miscellaneous Aspects of Analysis of Laminated Structures	10		b2	c2	d1
10	Miscellaneous Aspects of Analysis of Laminated Structures	11	a4			d1,d2
11	Laminate Bolted and Bonded Joints	12		b3	c2	d3
12	Laminate Bolted and Bonded Joints	13	a5		c3	d2
13	Analysis of Discontinuous Fiber-Reinforced Composites	14	a1	b2	c3	d1,d2

Course Coordinator:

Head of Department: Prof. Dr. Osama Ezzat Abdelatif

Matrix of Course Aims and ILO's

Course Title: Polymer and Composites

Course Code: MDP351

Teaching Hours: Lecture: 3 Tutorial: 2 Total: 5

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
Understand the fundamentals polymers and composites structure, forming techniques and application.	a1, a3	b1,b2		d1
Solve process/product problems related to the manufacturing of polymer and composites materials.	a2,a4,a5	b3		d2

Course Coordinator:

Head of Department: Prof. Dr. Osama Ezzat Abdelatif