



**BENHA UNIVERSITY**



**FACULTY OF ENGINEERING AT SHOUBRA**

**COURSE SPECIFICATIONS (2014-2015)**

**Model No.12**

**Course Specifications: Fracture Mechanics and Fatigue**

**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:** MDP353

**Course Title:** Fracture Mechanics and Fatigue

**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:**

By the end of the course the students will be able to:

1. Understand the basics of fracture mechanics theory.
2. Identify the different types and modes of failure.
3. Understand the mechanism of fatigue and creep failures.

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

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

- a.1) The different reasons for failure. (A.8).
- a.2) Different mode of failure (A.13).
- a.3) Modern issues in strain energy and crack propagation theories. (A.16).

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

- b.1) Apply analysis for failed machine components. (B.4).
- b.2) Assess the behavior of materials against crack propagation. (B.5).
- b.3) Estimate the fatigue life and creep rate. (B.13).

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

- c.1) Merge the engineering knowledge in physics and materials science to predict the performance of materials during its life. (C.2).
- c.2) Analyze experimental results obtained from stress-strain curve; (C.16).
- c.3) Perform tensile tests using universal testing machine. (C.18).

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

- d.1) Collaborate effectively within multidisciplinary team. (D.1)
- d.2) Communicate effectively. (D.3).
- d.3) Acquire entrepreneurial skills. (D.8).



## COURSE SPECIFICATIONS (2014-2015)

## 4- Course Contents

Week no.	Topics
1	Introduction to fracture mechanics
2	Fracture Mechanics Basics
3	Fracture Mechanics Basics
4	Fracture Mechanics Basics
5	Impact Fracture
6	Design Using Fracture Mechanics
7	Design Using Fracture Mechanics
8	Fatigue Fracture.
9	Fatigue Fracture.
10	Fracture due to creep.
11	Fracture due to creep.
12	Case Study

## 5- Teaching and Learning Methods

- 5.1- Lectures
- 5.2-Practical training / laboratory
- 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.
4. Final exam to assess knowledge, intellectual, professional and general skills.

## b- Assessment Schedule

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

## c- Weighting of Assessments

Assessment	Weight (%)
Midterm Examination	20
Final Term Examination	67
Oral Examination	0
Semester Work	8
Other Types of Assessment	5
<b>Total</b>	<b>100</b>



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**8- List of References**

**a- Course Notes:**

- 1- Course notes prepared by instructor.

**b- Recommended Books**

- F.C. Campbell, "Fatigue and Fracture: Understanding the basics", ASM International, 2012.
- Dominique Francois, Andre Pineau, Andre Zaoui, "Mechanical Behaviour of Materials: Fracture Mechanics and Damage", Vol.2, Springer, 2013.

**Course Coordinator:** Dr. Mohamed Hany Mahmoud Abdel-Maksoud

**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: Fracture Mechanics and Fatigue**

**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 to fracture mechanics	1	a1, a2			
2	Fracture Mechanics Basics	2	a3	b1		
3	Fracture Mechanics Basics	3		b1	c1	d2
4	Fracture Mechanics Basics	4	a1	b2	c1	
5	Impact Fracture	5	a3	b1	c2	
6	Design Using Fracture Mechanics	6	a2	b2	c1	d2
7	Design Using Fracture Mechanics	7		b3	c2	d3
8	Fatigue Fracture.	9	a2	b1	c2	d1
9	Fatigue Fracture.	10	a1	b3	c1	d1
10	Fracture due to creep.	11	a3	b1	c2	
11	Fracture due to creep.	12	a2	b2	c1	d2
12	Case Study	13		b1, b3	c2	d3

**Course Coordinator:** Dr. Mohamed Hany Mahmoud AbdelMaksoud

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**COURSE SPECIFICATIONS (2014-2015)**

**Matrix of Course Aims and ILO's**

**Course Title:** Fracture Mechanics and Fatigue

**Course Code:** MDP353

**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

<b>Course aims</b>	<b>Basic Knowledge</b>	<b>Intellectual skills</b>	<b>Professional skills</b>	<b>General skills</b>
Understand the basics of fracture mechanics theory.	a1, a3	b1,b3	c1,c3	d1,d3
Identify the different types and modes of failure	a1,a2	b2,b3	c1,c2,c3	d2,d3
Understand the mechanism of fatigue and creep failures.	a2	b1,b2	c1	d1,d2,d3

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