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| Shoubra Faculty of Engineering |  | | Course Specifications : **Failure Analysis and Fracture Mechanics(MED 515)** |  |
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**University**: Benha University

**Faculty**: Shoubra Faculty of Engineering

**Department**: Mechanical Engineering Department

**Program(s) on which the course is given:** Post Graduate **Diploma.** In Production & Design (Material Engineering)

**Compulsory or Elective element of program:** Elective

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

**Academic year / Level:** year/ 2014/2015

**Date of specification approval:** 2012

1. **Basic Information**

**Title: Failure Analysis and Fracture Mechanics Code:** MED 515

**Credit Hours: 3 Lecture: 3**

**Tutorial: - Practical: - Total: 3**

1. **Professional Information**
2. **Course Aims:**

This course introduces students to:

1. Study materials properties and their applicationsin enhanced mechanical engineering designs.
2. Promote new trends in engineering materials and their enhanced mechanical properties.
3. Provide study of the design of tests for materials properties.
4. **Intended Learning Outcomes of Course (ILOs)**

By completion of the course, the student would able to promote:

**2.1. Knowledge and Understanding:**

2.1.4 Explain the effect of influence of static loads and fatigue on the failure of materials.

2.1.5 Demonstrate methodologies and computer tools available for analysis of fracture growth in static fracture and corrosion.

**2.2. Intellectual Skills:**

2.2.1 Describe and analyze the problems of fatigue and corrosion.

2.2.3 Promote creative and analytical thinking in the area of types of wear and friction.

2.2.5 Make professional decisions in the o available types of lubricant.

2.2.6 Evaluate data sources and make sound judgments in the tribological failure of surfaces.

**2.3. Professional and Practical Skills:**

2.3.1 Apply professional skills in the creep failure.

2.3.2 Prepare professional reports about buckling and creep tests.

2.3.3 Plan and implement experiment design and evaluate materials testing.

**2.4. General and Transferable Skills:**

2.4.1 Communicate effectively using date to make a case study.

2.4.3 Assess him/her and identify his/her own personal learning needs.

2.4.5 Work in a group to make a professional report.

2.4.7 Conduct self-learning and continuous education practices.

**3- Course Contents:**

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| **No of week** | **Topic** | **No. of hours** | **Program ILOs** |
| 1 | Introduction to fracture mechanics | 3 | (2.1.2), (2.1.4), (2.1.5) |
| 2 | Fractures under the influence of static load | 3 |
| 3 | The beginning of fracture growth in static fracture | 3 |
| 4 | fracture growth under influence of fatigue – Fatigue age | 3 |
| 5 | Non-destructive techniques for discovering defects | 3 |
| 6, 7 | Corrosion failures | 6 | (2.1.4), (2.1.5), (2.2.1) |
| 8 | Mid-term exam | 3 | - |
| 9, 10 | Tribological failure of surface | 6 | (2.2.3), (2.2.5), (2.2.6) |
| 11 | Buckling | 3 | (2.3.1) |
| 12 | Creep failure – Creep age . | 3 | (2.3.2) |
| 13 | Case Studies | 3 | (2.3.3), (2.4.1) |
| 14 | Oral exam | 3 | (2.4.3), (2.4.5), (2.4.7) |
| 15 | Final-term exam | 3 | - |
| Total | | 45 |  |

**4- Course Matrix:**

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| **ILO’s code number** | **Teaching/learning methods and strategies** | **Assessment methods and strategies** |
| 2.1.2  2.1.4  2.1.5 | Formal lectures. | Individual coursework assignments, quizzes, oral discussions and reports. Mid-year and /or final written examination is given. |
| 2.2.1  2.2.3  2.2.5  2.2.6 | Analysis and problem-solving skills are developed through tutorial/problem sheets and small group exercises. | Analysis and problem-solving skills are assessed through oral and written examinations. |
| 2.3.1  2.3.2  2.3.3 | Experiments demonstrations, practical work, | Coursework exercises and reports, project reports and presentations. |
| 2.4.1  2.4.3  2.4.5  2.4.7 | Those skills are not explicitly taught; however, along the course of study the student will acquire those skills to be able to perform his obligations. | Project presentation. |

**5-Assessment Schedule:**

Assessment 1 Assignments on weeks 2,3,4,5,7,9,11,13

Assessment 2 Quizzes on weeks 6, 12

Assessment 3 Mid-term exam on weeks 8

Assessment 4 Oral exam on week 14

Assessment 5 Final exam on week 15

**6- Weighting of Assessments:**

* 20% (60 points) Home assignments, Quizzes, and reports
* 20% (60 points) Mid-term examination and Oral examination
* 60% (180 points) Final-term examination
* 100% (300 points) Total

**7- List of References:**

7.**1 Essential Books (Text books):**

* Course notes prepared by instructor (Power Point & Case Studies)
* TaoufikBoukharouba, ‎MimounElboujdaini, ‎Guy Pluvinage, “Damage and Fracture Mechanics, (2009)
* Hani M. Tawancy, ‎Anwar Ul-Hamid, ‎Nureddin M. Abbas, “Practical Engineering Failure Analysis, (2004).

**7.2 Recommended Books&Websites.**

* www.google.com
* www.sciencedirect.com

**8- Facilities Required for Teaching and Learning:**

* Lecture room equipped with overhead projector
* Presentation board, computer and data show

**Course coordinator:**

**Course instructor:**

**Head of department:** Prof. Dr.Osama Ezzat