



Arab Academy for Science, Technology & Maritime Transport  
 College of Engineering & Technology  
 Mechanical Engineering Department

**University/Academy:** Arab Academy for Science, Technology & Maritime Transport  
**Faculty/Institute:** College of Engineering & Technology  
**Program:** B.Sc. Mechanical Engineering

Form no. (12): **Course Specification**

**1- Course Data**

Course Code: <b>ME 276</b>	Course Title: <b>Stress analysis</b>	Academic Year/Level: <b>2nd year / 4th semester</b>	
Specialization: <b>Mechanical</b>	No. of Instructional Units <b>3 credits</b>	Lecture <b>2 hrs.</b>	Practical <b>2 hrs.</b>

**2- Course Aim**

- To present the advanced concepts and modern techniques of stress and strain analysis with applications to mechanical components and various structures and to introduce the students to the finite element method
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**3- Intended Learning Outcomes**

<b>a- Knowledge and Understanding</b>	<p><b>Through knowledge and understanding, students will be able to:</b></p> <p>a.1) Concepts and theories of mathematics and sciences, appropriate to the discipline</p> <p>a.3) Characteristics of engineering materials related to the discipline</p> <p>a.4) Principles of design including elements design, process and/or a system related to specific disciplines.</p> <p>a.p.7) Basic theories and principles of some other engineering and mechanical engineering disciplines</p> <p>Providing support to mechanical power and energy disciplines.</p>
<b>b- Intellectual Skills</b>	<p><b>Through intellectual skills, students will be able to:</b></p> <p>b.2) Select appropriate solutions for engineering problems based on analytical thinking.</p> <p>b.9) Judge engineering decisions considering balanced costs, benefits, safety, quality, reliability, and environmental impact</p> <p>b.11) Analyze results of numerical models and assess their limitations.</p> <p>b.12) Create systematic and methodic approaches when dealing with new and advancing technology.</p>

<b>c- Professional Skills</b>	<b>Through professional and practical skills, students will be able to:</b>
<b>d- General Skills</b>	<b>Through general and transferable skills, students will be able to:</b>

#### **4- Course Content**

<b>Week No.1</b>	Introduction to the concept of stress and strain: Normal stresses and strains.
<b>Week No.2</b>	Shear stresses, shearing strains and bearing stresses.
<b>Week No.3</b>	Shear stresses and deformations due to torsion.
<b>Week No.4</b>	Normal forces, shearing forces and bending moments in beams.
<b>Week No.5</b>	Stresses due to bending.
<b>Week No.6</b>	Stress and strain transformations: Introduction.
<b>Week No.7</b>	Stress and strain transformations: Principal stresses and planes and Mohr's circle of stress / 7th week evaluation
<b>Week No.8</b>	Maximum shear stress, yield criteria, analysis of strain.
<b>Week No.9</b>	Analysis of stresses in thin walled and thick walled pressure cylinders.
<b>Week No.10</b>	Stress concentration in machine elements.
<b>Week No.11</b>	Experimental stress analysis: strain gauges.
<b>Week No.12</b>	Deflection due to bending: Double integration / 12 <sup>th</sup> week evaluation
<b>Week No.13</b>	Deflection due to bending: Strain energy and Castigliano's method..
<b>Week No.14</b>	Buckling of columns: Euler equation.
<b>Week No.15</b>	Buckling of columns: Eccentric loading of slender columns.
<b>Week No.16</b>	Final examination

#### **5- Teaching and Learning Methods**

- Lectures
- Tutorials
- Reports & sheets
- Laboratories
- Seminars

## 6-Teaching and Learning Methods for Students with Special Needs

- Lectures
- Tutorials
- Reports & sheets
- Laboratories
- Seminars

### Engineering Requirements and Design Considerations in college Buildings and its Leading Passages

- The design of college buildings and pedestrian passages leading to it are sloppy to allow the transportation of the handicapped;
- Doors are wide enough to let wheel chairs pass through easily and conveniently.
- Lifts are provided for movement between floors.
- Doors are made from light weight materials to make it easy for the handicapped suffering from weakness in limb muscles or those handicapped using prosthetic limbs to deal with them with the least muscular effort.
- Class floors are made from non-slippery materials to prevent falls on the part of the handicapped.
- Sudden changes in the floor level are prevented.

### Design Considerations of the Classes

- Class boards are placed at 60 cm high to allow wheeled chair users or those suffering from limited arm mobility use them.
- Enough spaces are left between seats and benches to prevent hindering the movement of wheeled chairs between them.
- Handicapped students sit among normal people in class to be able to interact with them. Nevertheless, in urgent cases according to the nature of the disability, the handicapped students sit in fixed suitable places whether at the front or the back of the class.
- Handicapped students sit close to the main exits of the class to be able to evacuate in case of emergencies.

### Academic Support:

- The general academic advisor appoints an academic supervisor for handicapped students.
- Continuous follow ups are made for handicapped students after each assessment to evaluate their academic level of achievement

## 7- Student Assessment

<b>a-Procedures used</b>	1-Written Examinations to assess The Intended Learning Outcomes. 2-Class Activities (Reports, Discussions, -----) to assess The Intellectual Skills.
<b>b- Schedule:</b>	Assessment 1                      7 <sup>th</sup> Week Assessment Assessment 2                      12 <sup>th</sup> Week Assessment Assessment 3                      Continuous Assessments Assessment 4                      16 <sup>th</sup> Week Final Written Exam

<b>c- Weighing of Assessment</b>	7 <sup>th</sup> Week Evaluation	30 %
	12 <sup>th</sup> Week Evaluation	20 %
	Final-term Examination	40 %
	Oral Examination	00 %
	Practical Examination	00 %
	Semester Work	10 %
	Total	100%

#### 8- List of References:

<b>a- Course Notes</b>	N/A
<b>b- Required Books</b> (Textbooks)	<ul style="list-style-type: none"> <li>• R. C. Hibbler, "Mechanics of Materials," Latest edition.</li> </ul>
<b>c- Recommended Books</b>	<ul style="list-style-type: none"> <li>• Beer and Johnson "Mechanics of Materials", McGraw Hill, 1992, 2nd edition.</li> <li>• Benham, Crawford and Armstrong "Mechanics of Engineering Materials", Prentice Hall, 1996, 1st edition.</li> <li>• West "Fundamentals of Structural Analysis" John Wiley and Sons, 1993, 1st edition.</li> <li>• Gere and Timoshenko "Mechanics of Materials ", PWS. Publisher, 1997, 4th edition.</li> <li>• Muvadi and Mcnabb "Engineering Mechanics of Materials", Macmillan Pr., 1984, 2nd edition.</li> <li>• Hibbeler "Mechanics of Materials", Prentice Hall, 2007, 7th edition.</li> </ul>
<b>d- Periodicals, Web Sites, etc.</b>	N/A

Course Instructor: **Dr. Mohamed Fahmy**

Head of Department: **Prof. El-Sayed Saber**

Program Manager: **Prof. El-Sayed Saber**

**Dean of College of Engineering and Technology of AASTMT**

Name: **Prof. Moustafa Hussein Aly**

Signature:

**Executive Manager of Quality Assurance Center of AASTMT**

Name: **Prof. Aziz Ezzat**

Signature: