City University of Hong Kong

Information on a Course
offered by the Department of Physics and Materials Science
with effect from Semester A in 2013 / 2014

Part I

Course Title: Stress Analysis
Course Code: AP4114
Course Duration: One semester
No of Credit Units: 3
Level: B4
Medium of Instruction: English
Prerequisites: Nil
Precursors: AP2104 Mechanics of Solids
 AP2201 Measurement and Instrumentation I
 MA2157 Foundation Mathematics & Statistics
 MA3158 Linear Algebra & Calculus
Equivalent Courses: Nil
Exclusive Courses: AP8114 Stress Analysis

Part II

1. Course Aims:

This course will provide students with adequate grounding in stress analysis for designing mechanical parts with simple geometries under practical loading conditions.
2. **Course Intended Learning Outcomes (CILOs)**

*Upon successful completion of this course, students should be able to:*

<table>
<thead>
<tr>
<th>No</th>
<th>CILOs</th>
<th>Level of Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Describe the various experimental methods for stress and strain measurements.</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Determine the boundary conditions of simple engineering structures under loadings.</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Apply different analytical approaches, including the stress function and the energy methods, to analyse stress and strain in simple engineering structures.</td>
<td>1</td>
</tr>
</tbody>
</table>

Remarks: 1 is the least importance

3. **Teaching and Learning Activities (TLAs)**

*(designed to facilitate students’ achievement of the CILOs)*

<table>
<thead>
<tr>
<th>TLAs</th>
<th>Large Class Activities</th>
<th>Small Class Activities</th>
<th>Lab Work</th>
<th>Total no of hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CILO 1</td>
<td>4</td>
<td>1</td>
<td>8</td>
<td>13</td>
</tr>
<tr>
<td>CILO 2</td>
<td>9</td>
<td>2.5</td>
<td>3</td>
<td>14.5</td>
</tr>
<tr>
<td>CILO 3</td>
<td>13</td>
<td>3</td>
<td>1</td>
<td>17</td>
</tr>
<tr>
<td>Total (hrs)</td>
<td>26</td>
<td>6.5</td>
<td>12</td>
<td>44.5</td>
</tr>
</tbody>
</table>

Scheduled activities: 2 hrs lecture + 0.5 hr tutorial + 1hr laboratory

4. **Assessment Tasks/Activities**

*(designed to assess how well the students achieve the CILOs)*

4.1 Course Grade

Examination duration: 2 hrs
Percentage of coursework, examination, etc.: 30% by coursework; 70% by exam
To pass the course, students need to achieve at least 30% in the examination.

<table>
<thead>
<tr>
<th>ATs</th>
<th>Exam</th>
<th>Assigns</th>
<th>Mid-term Test</th>
<th>Lab Report</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CILO 1</td>
<td>10</td>
<td>0</td>
<td>2</td>
<td>7</td>
<td>19</td>
</tr>
<tr>
<td>CILO 2</td>
<td>25</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>35</td>
</tr>
<tr>
<td>CILO 3</td>
<td>35</td>
<td>6</td>
<td>4</td>
<td>1</td>
<td>46</td>
</tr>
<tr>
<td>Total (%)</td>
<td>70</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>100</td>
</tr>
</tbody>
</table>

4.2 Achievement of CILOs

CILO 1: Achievement of this CILO can either be assessed from the overall laboratory score and/or part of a specifically designed question in the final examination.

CILO 2: At least one question in the final examination will be specifically set to check whether student can determine boundary conditions of simple engineering structures under loading.
CILO 3: At least one question in the final examination will be specifically set to check whether students can apply the analytical techniques to determine stress and strain in simple engineering structures.

5. **Grading of Student Achievement:** Refer to Grading of Courses in the Academic Regulations

The grading is assigned based on students’ performance in assessment tasks/activities.

**Grade A**
The student completes all assessment tasks/activities and the work demonstrates excellent understanding of the scientific principles and the working mechanisms. He/she can thoroughly identify and explain how the principles are applied to science and technology for solving physics and engineering problems. The student’s work shows strong evidence of original thinking, supported by a variety of properly documented information sources other than taught materials. He/she is able to communicate ideas effectively and persuasively via written texts and/or oral presentation.

**Grade B**
The student completes all assessment tasks/activities and can describe and explain the scientific principles. He/she provides a detailed evaluation of how the principles are applied to science and technology for solving physics and engineering problems. He/she demonstrates an ability to integrate taught concepts, analytical techniques and applications via clear oral and/or written communication.

**Grade C**
The student completes all assessment tasks/activities and can describe and explain some scientific principles. He/she provides simple but accurate evaluations of how the principles are applied to science and technology for solving physics and engineering problems. He/she can communicate ideas clearly in written texts and/or in oral presentations.

**Grade D**
The student completes all assessment tasks/activities but can only briefly describe some scientific principles. Only some of the analysis is appropriate to show how the principles are applied to science and technology for solving physics and engineering problems. He/she can communicate simple ideas in writing and/or orally.

**Grade F**
The student fails to complete all assessment tasks/activities and/or cannot accurately describe and explain the scientific principles. He/she fails to identify and explain how the principles are applied to science and technology for solving physics and engineering problems objectively or systematically. He/she is weak in communicating ideas and/or the student’s work shows evidence of plagiarism.
Part III

Keyword Syllabus:

- Introduction of stress and strain in 2/3D.
- Stress function approach.
- Airy’s stress function in Cartesian and polar coordinates. Boundary conditions. Applications to simple two-dimensional problems. Applications to axial symmetric problems.
- Energy methods.
- Strain gauge systems.
- Electrical-resistance strain gauges, types of strain gauge. Strain gauge circuits, recording instruments, and strain gauge rosette.
- Optical methods of stress analysis.

Recommended Reading:
Reference Book(s):