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| <b>Module Title:</b>   | Mechanics of Materials 3  |
| <b>Language of Instruction:</b>  | English   |
| <b>Credits:</b>  | 5   |
| <b>NFQ Level:</b>  | 7   |
| <b>Module Delivered In</b>   | No Programmes   |
| <b>Teaching &amp; Learning Strategies:</b>   | The module will be delivered using lectures and tutorials with a mixture of presentations, example exercises, question and answer sessions, group discussions and online resources. Laboratory classes will be delivered to students working in groups to obtain experimental data with subsequent individual reporting/assessment. |
| <b>Module Aim:</b>   | To provide the student with an understanding of the internal effects of forces applied to members in structures and mechanisms, as evidenced by the stresses and deformations produced. To provide the student with an understanding of the response of structures due to the properties of materials                               |
| <b>Learning Outcomes</b>   |   |
| <i>On successful completion of this module the learner should be able to:</i>  |   |
| LO1  | Demonstrate the ability to analyse loads on mechanical components in order to determine the type and distribution of resulting reactions and the type and distribution of induced stress and strain.  |
| LO2  | Apply simplified models of stress and strain to representative systems in order to determine relationships between loads and the corresponding stress and strain.   |
| LO3  | Predict the behaviour and/or failure of mechanical systems subjected to loads.  |
| LO4  | Predict the behaviour of materials in service   |
| LO5  | Quantify, by calculation and experimental measurement, the characteristic response of mechanical systems.   |
| <b>Pre-requisite learning</b>  |   |
| <b>Module Recommendations</b><br><i>This is prior learning (or a practical skill) that is recommended before enrolment in this module.</i>         |   |
| No recommendations listed  |   |
| <b>Incompatible Modules</b><br><i>These are modules which have learning outcomes that are too similar to the learning outcomes of this module.</i> |   |
| No incompatible modules listed   |   |
| <b>Co-requisite Modules</b>  |   |
| No Co-requisite modules listed   |   |
| <b>Requirements</b><br><i>This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed.</i>          |   |
| No requirements listed   |   |

## Module Content & Assessment

| Indicative Content  |
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| <ul style="list-style-type: none"> <li>• <b>Uniaxial Stress</b> <ul style="list-style-type: none"> <li>o Statically indeterminate force/stress systems</li> <li>o Induced stress due to changes in volume and thermal effects</li> </ul> </li> <li>• <b>Torsion</b> <ul style="list-style-type: none"> <li>o Statically Indeterminate Systems, o Torsion in thin walled shells.</li> </ul> </li> <li>• <b>Frames &amp; Machines</b> <ul style="list-style-type: none"> <li>o Multiforce members</li> </ul> </li> <li>• <b>Beams and Bending</b> <ul style="list-style-type: none"> <li>o Bending Equation, o Normal stress due to bending moment, o Shear stress due to shear force.</li> </ul> </li> <li>• <b>Slope &amp; deflection of beams</b> <ul style="list-style-type: none"> <li>o Integration method, o Macaulay functions.</li> </ul> </li> <li>• <b>Energy Theorems</b> <ul style="list-style-type: none"> <li>o Helical Springs</li> </ul> </li> <li>• <b>Stress strain relations</b> <ul style="list-style-type: none"> <li>o Plane stress o Mohr's stress circle o Three dimensional stress o Introduction to strain measurement</li> </ul> </li> <li>• <b>Failure Criteria</b> <ul style="list-style-type: none"> <li>o Tresca &amp; von Mises Failure criteria</li> </ul> </li> <li>• <b>Stress and Strain Variation</b> <ul style="list-style-type: none"> <li>o Stress, strain and displacement relationships o Thick Cylinders</li> </ul> </li> <li>• <b>Properties and behaviour of Materials in service</b> <ul style="list-style-type: none"> <li>o Stress concentration</li> </ul> </li> <li>• <b>Finite Element Method</b> <ul style="list-style-type: none"> <li>o Introduction to Finite Element Method</li> </ul> </li> </ul> |

| Assessment Breakdown             | %      |
|----------------------------------|--------|
| Continuous Assessment            | 15.00% |
| Practical                        | 15.00% |
| End of Module Formal Examination | 70.00% |

| Continuous Assessment |   |                   |            |                 |
|-----------------------|---|-------------------|------------|-----------------|
| Assessment Type       | Assessment Description                                  | Outcome addressed | % of total | Assessment Date |
| Examination           | Class Test: Uniaxial Stress, Torsion, Frames & Machines | 1,2               | 5.00       | Week 12         |
| Examination           | Class Test: Beams and Bending, Plane Stress             | 1,2               | 5.00       | Week 25         |
| Written Report        | Mechanical Design Assignment                            | 1,2,3             | 5.00       | n/a             |

No Project

| Practical                   |  |                   |            |                 |
|-----------------------------|--|-------------------|------------|-----------------|
| Assessment Type             | Assessment Description   | Outcome addressed | % of total | Assessment Date |
| Practical/Skills Evaluation | Labs: Deflection of Beams, Statically Indeterminate Systems, Helical Spring, Thick Cylinder, Buckling of Slender Columns. Laboratory preparation work, Laboratory Report and written assessment. | 1,2,5             | 15.00      | n/a             |

| End of Module Formal Examination |   |                   |            |                 |
|----------------------------------|---|-------------------|------------|-----------------|
| Assessment Type                  | Assessment Description  | Outcome addressed | % of total | Assessment Date |
| Formal Exam                      | A final written examination will assess the extent to which the student has achieved the module learning outcomes | 1,2,3,4,5         | 70.00      | End-of-Semester |

SETU Carlow Campus reserves the right to alter the nature and timings of assessment

**Module Workload**

| <b>Workload: Full Time</b> |                  |  |
|----------------------------|------------------|--|
| <i>Workload Type</i>       | <i>Frequency</i> | <i>Average Weekly Learner Workload</i> |
| Lecture                    | Every Week       | 2.00                                   |
| Laboratory                 | Every Week       | 1.00                                   |
| Estimated Learner Hours    | Every Week       | 2.00                                   |
| Total Hours                |                  | 5.00                                   |

