

|  |   |
|--|---|
| <b>Module Code</b>   | MEU33B04  |
| <b>Module Name</b>   | Mechanical Engineering Materials  |
| <b>ECTS Weighting</b>  | 5 ECTS  |
| <b>Semester taught</b>   | Semester 2  |
| <b>Module Coordinator/s</b>  | Assoc. Prof. Kevin O’Kelly  |
| <b><a href="#">Module Learning Outcomes</a> with reference to the <a href="#">Graduate Attributes</a> and how they are developed in discipline</b> | <p>LO1. Understand different mechanism of material deformation and failure and perform calculations relating deformation under load to the atomic structure and microstructure of materials.</p> <p>LO2. Calculate the failure loads and times for simple structures and apply these predictions for complex engineering components to ensure safe life in conjunction with maintenance.</p> <p>LO3. Predict how material microstructure will be affected by alloy compositions and thermo-mechanical treatment.</p> <p>LO4. Describe the structure and mechanical properties of different engineering materials including metals, polymers, ceramics and composites.</p> <p>LO5. Apply knowledge to select suitable materials for specific engineering applications.</p> <p>LO6. Appreciate the importance of preventing failure in engineering components, especially its social and ethical consequences.</p> <p><b>Graduate Attributes: levels of attainment</b></p> <p>To act responsibly - Enhanced</p> <p>To think independently - Enhanced</p> <p>To develop continuously - Enhanced</p> <p>To communicate effectively - Enhanced</p> |
| <b>Module Content</b>  | <p>This module introduces the student to essential concepts in the selection and use of engineering materials for biomedical and mechanical applications. This includes understanding how the atomic and microscopic structure of materials influence their mechanical properties. Various modes of failure including creep, fatigue, fracture and wear will be examined. Different types of materials (including metal alloys, polymers, ceramics and composites) and their mechanical behaviour will be explored. Material processes and environmental conditions that alter the mechanical characteristics of the materials shall be considered. This information will then be used to select suitable materials for specific applications and determine why some materials fail under certain conditions.</p>   |

|  |  |   |              |            |             |   |   |   |
|--|--|---|--------------|------------|-------------|---|---|---|
| <b>Teaching and Learning Methods</b>   | <p>This module is taught using a combination of lectures, laboratory exercises and tutorial sessions. The tutorial sessions are overseen by a Teaching assistant where students work in groups to develop their communication and teamwork skills.</p> <p>COVID-19 contingency: Should there be restrictions due to COVID-19, this module will be taught fully online.</p>   |   |              |            |             |   |   |   |
| <b>Assessment Details</b><br>Please include the following: <ul style="list-style-type: none"> <li>• <b>Assessment Component</b></li> <li>• <b>Assessment description</b></li> <li>• <b>Learning Outcome(s) addressed</b></li> <li>• <b>% of total</b></li> <li>• <b>Assessment due date</b></li> </ul> | Assessment Component   | Assessment Description                  | LO Addressed | % of total | Week due    |   |   |   |
|  | Written examination  | End of semester examination             | 1-6          | 50         | Exam period |   |   |   |
|  | Continuous assessment  | Combination of on-line labs and quizzes | 1-6          | 50         | Weeks 3-12  |   |   |   |
|  |  |   |              |            |             |   |   |   |
| <b>Reassessment Requirements</b>   | Written Examination  |   |              |            |             |   |   |   |
| <b>Contact Hours and Indicative Student Workload</b>   | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td data-bbox="630 1100 1451 1234"> <b>Contact hours: 45 (lectures and tutorials)</b> </td> </tr> <tr> <td data-bbox="630 1234 1451 1409"> <b>Independent Study (preparation for course and review of materials): 50</b> </td> </tr> <tr> <td data-bbox="630 1409 1451 1591"> <b>Independent Study (preparation for assessment, incl. completion of assessment): 25</b> </td> </tr> </table> |   |              |            |             | <b>Contact hours: 45 (lectures and tutorials)</b> | <b>Independent Study (preparation for course and review of materials): 50</b> | <b>Independent Study (preparation for assessment, incl. completion of assessment): 25</b> |
| <b>Contact hours: 45 (lectures and tutorials)</b>  |  |   |              |            |             |   |   |   |
| <b>Independent Study (preparation for course and review of materials): 50</b>  |  |   |              |            |             |   |   |   |
| <b>Independent Study (preparation for assessment, incl. completion of assessment): 25</b>  |  |   |              |            |             |   |   |   |
| <b>Recommended Reading List</b>  | Engineering Materials 1 & 2, MF Ashby & DRH Jones (Butterworth-Heinemann)  |   |              |            |             |   |   |   |
| <b>Module Pre-requisite</b>  | CEU22E08 Materials <u>or</u> MEU22M04 Materials <u>or</u> equivalent module  |   |              |            |             |   |   |   |
| <b>Module Co-requisite</b>   | None   |   |              |            |             |   |   |   |

|   |  |
|---|--|
| <b>Module Website</b>   | <a href="http://www.tcd.ie/Engineering/undergraduate/baiyear3/modules/3B4.pdf">www.tcd.ie/Engineering/undergraduate/baiyear3/modules/3B4.pdf</a> |
| <b>Are other Schools/Departments involved in the delivery of this module? If yes, please provide details.</b> | No   |
| <b>Module Approval Date</b>   |  |
| <b>Approved by</b>  |  |
| <b>Academic Start Year</b>  |  |
| <b>Academic Year of Date</b>  |  |