Module Template for New and Revised Modules[1]

Module Code	CEU22E04
Module Name	Solids and Structures
ECTS Weighting[2]	5 ECTS
Semester taught	Semester 1
Module Coordinator/s	Prof. Brendan O'Kelly Module delivery: Prof. Brendan O'Kelly (50%), Prof. Dermot O'Dwyer (50%)
Module Learning Outcomes with reference to the Graduate Attributes and how they are developed in discipline	On successful completion of this module, students should be able to: LO1. Calculate section properties and the stress, deformation and strain responses of structural members (both elastic and plastic) under a system of applied loads and calculate the buckling load capacity of struts. LO2. Analyse structural systems (members, connections and assemblies) to determine sectional axial, shear, torsion and bending forces in statically determinate structures. LO3. Analyse continuous beams, frames and trusses and calculate deflections using Mohr's moment area method, virtual work and other techniques and assess performance under different limit states. LO4. Apply the method of Mohr's circle to Analyse 2D stress states. Apply Young's modulus, the shear modulus and Poisson's ration to solve elastic stress/strain problems. **Graduate Attributes: levels of attainment** To act responsibly - Enhanced To think independently - Enhanced To develop continuously - Choose an item. To communicate effectively - Enhanced

[1] An Introduction to Module Design from AISHE provides a great deal of information on designing and re-designing modules.
[2] TEP Glossary

Module Content	**Mechanics of Solids** • Elastic Plastic Behaviour Stress, strain, elasticity and plasticity; one-dimensional stress–strain relationships; Young's modulus of elasticity, shear modulus and Poisson's ratio; two-dimensional elasticity; isotropic and homogeneous materials; ductile and brittle materials; transformation of stress and strain; properties of sections (A and I); axial, shear and bending distortions. • Analysis of Structural Members Connection design in trusses; torsion of shafts; buckling of struts; lateral torsional buckling; factors of safety **Structures** • Statically determinate pin-jointed structures Analysis using joint-equilibrium, method of sections and by inspection; statical determinacy; deflection of trusses using principle of virtual work • Analysis of Beams and Frames Axial, shear force and bending moment diagrams; equation of condition, load function equation, qualitative analysis for 2D frames; analysis for bending stress; cover plate design; analysis for shear stress and torsional stress • Beam Deformations Bending deflections using moment–curvature equation; Mohr's moment area theorems; shear deformations, torsional deformations
Teaching and Learning Methods	The module is taught using a combination of lectures, laboratories and tutorials. Most material (notes, textbook, tutorials, examinations) is provided on the College network. Students work in tutorial and laboratory groups in solving problems thereby encouraging teamwork and cooperation, whereas the laboratory research reports are carried out individually. Associated laboratory/project/tutorial programme • Beam bending (laboratory experiment and research report); • Buckling of slender columns (laboratory experiment and research report); • Tutorial assignments (1 - 10). • Projects (x2) – Engineering in Climate Action (a) Adaptation, (b) Mitigation

Assessment Component	Assessment Description	LO Addressed	% of total	Week due

Assessment Details[3]
Please include the following:

- **Assessment Component**
- **Assessment description**
- **Learning Outcome(s) addressed**
- **% of total**
- **Assessment due date**

Written Exam	In-person MCQ examination	1 – 4	85%	
Lab Reports	Reports on two laboratory experiments	1 & 3	15%	

Reassessment Requirements

Contact Hours and Indicative Student Workload[3]

Contact hours: 125
Independent Study (preparation for course and review of materials): 100
Independent Study (preparation for assessment, incl. completion of assessment): **25**

Recommended Reading List

· Strength of Materials by GH Ryder (Macmillan) 620.11 K98

· Mechanics of Materials by EJ Hearn (Pergamon) 620.11 L73

· Mechanics of Material, (SI ed.) by Gere and Timoshenko (Wadsorth Int.)

· Mechanics of Engineering Materials by PP Benham and RJ Crawford (Longman)

· Structures—or why things don't fall down by JE Gordon (Penguin).

· Introduction to Structural Mechanics, Reynolds, Kent and Lazenby, 628.17 L38

· Mechanics of Engineering Materials, Bowes, Russell and Suter, 620.11 M42

· Structural Mechanics, Williams, Morgan and Durka, PL 49 111

Module Pre-requisite

1E7 Mechanics

Module Co-requisite

[3] TEP Guidelines on Workload and Assessment

Module Website	Blackboard
Are other Schools/Departments involved in the delivery of this module? If yes, please provide details.	No
Module Approval Date	
Approved by	
Academic Start Year	September 2022
Academic Year of Date	2022-2023