Module Code	EEU22E12
Module Name	COMPUTATIONAL SCIENCE AND ENGINEERING 1
ECTS Weighting[1]	5 ECTS
Semester taught	Semester 2
Module Coordinator/s	Hossein Javidnia and Anil Kokaram
Module Learning Outcomes with reference to the Graduate Attributes and how they are developed in discipline	On successful completion of this module, students will be able to: 1. Explain the need for computational solutions to engineering problems. 2. Describe how numerical methods incur errors. 3. Use Matlab to apply computational solutions to Engineering problems 4. Explain and apply least squares optimisation to data modelling 5. Explain and apply numerical solutions to differential equations. 6. Perform basic linear and non-linear optimization 7. Perform numerical integration and differentiation 8. Apply the finite element method to basic engineering problems 9. Assess computational load and describe implications for sustainability in terms of energy consumption **Graduate Attributes: levels of attainment** To act responsibly - Enhanced To think independently - Attained To develop continuously - Enhanced To communicate effectively - Introduced
Module Content	This is a module on the application of mathematical methods to gain approximate solutions to real world engineering problems. This module demonstrates why there is frequently a need for numerical solutions to real-world problems, and introduces the high-level programming environments of Matlab (optionally Python) to code basic solutions to Engineering problems. The module also introduces best practice Engineering coding methodology used in companies like Google and YouTube. The Mathematics which underpin this module have been largely covered in previous Mathematics modules. This module therefore provides a link between pure Mathematics and Engineering applications encountered in industry and in research.

[1] TEP Glossary

Teaching and Learning Methods	Lectures: The teaching strategy broadly follows a single textbook [1] for the core material, to assist in student revision. Tutorials: there are weekly assignments using Matlab to implement each numerical method guided by teaching assistants who are recruited from the postgraduate student body in the School of Engineering.

Assessment Details[2]
Please include the following:

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

Assessment Component	Assessment Description	LO Addressed	% of total	Week due
Examination	Written 2hr examination	All	80%	As per summer examination schedule
Assignments	Assignments are submitted on a bi-weekly basis	All	20%	Due Weeks 1 to 12

Reassessment Requirements

Contact Hours and Indicative Student Workload[2]

Contact hours: 44
Independent Study (preparation for course and review of materials): 44
Independent Study (preparation for assessment, incl. completion of assessment): 32

Recommended Reading List

- Numerical Methods for Engineers by Steven Chapra & Raymond Canale, McGraw Hill, 7th Edition.
- Numerical Recipes in C, The Art of Scientific Comp uting, by Press, Teukolsky, Vetterling and Flannery, Cambridge University Press, 3rd Edition

Module Pre-requisite	Mathematics (JF), Physics, Basic knowledge of Linear Algebra (JF Level)
Module Co-requisite	
Module Website	On Blackboard
Are other Schools/Departments involved in the delivery of this module? If yes, please provide details.	No
Module Approval Date	

[2] TEP Guidelines on Workload and Assessment

Approved by	Prof. Naomi Harte
Academic Start Year	September 2025
Academic Year of Date	2025/26