Module Code	EEU22E12
Module Name	COMPUTATIONAL SCIENCE AND ENGINEERING 1
ECTS Weighting[1]	5 ECTS
Semester taught	Semester 2
Module Coordinator/s	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 should be able to: On successful completion of this module, students will (be able to): 1. Understand the need for numerical solutions to engineering problems. 2. Understand how numerical methods incur errors. 3. Use Matlab and Excel or Python to implement solutions to Engineering problems. 4. Perform basic statistical analysis. 5. Use the Taylor Series as a basis for error estimation. 6. Find numerical solutions to systems of equations. 7. Perform basic optimization. 8. Program curve fitting methods. 9. Perform numerical integration and differentiation. 10. Find numerical solutions to differential equations. 11. Apply the finite element method to basic engineering problems. **Graduate Attributes: levels of attainment** To act responsibly - Enhanced To think independently - Attained To develop continuously - Enhanced To communicate effectively - Choose an item.
Module Content	Please provide a brief overview of the module of no more than 350 words written so that someone outside of your discipline will understand it. 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 Excel, Matlab (and 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

[1] TEP Glossary

	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.
Teaching and Learning Methods	Lectures: The teaching strategy broadly follows a single text book [1] for the core material, to assist in student revision. Tutorials: there are weekly assignments using either Excel or Matlab or Python 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		65%	1st June 2023
Assignments	Assignments are submitted on a weekly basis		35%	Due Weeks 1 to 12

Reassessment Requirements

Contact Hours and Indicative Student Workload[2]

Contact hours: 44

[2] TEP Guidelines on Workload and Assessment

	Independent Study (preparation for course and review of materials):
	Independent Study (preparation for assessment, incl. completion of assessment):
Recommended Reading List	1. Numerical Methods for Engineers by Steven Chapra & Raymond Canale, McGraw Hill, 7th Edition. 2. Numerical Recipes in C, The Art of Scientific Computi ng, 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	
Approved by	
Academic Start Year	September 2023
Academic Year of Date	2023/24