MODULE DESCRIPTION FORM

DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING

ME108 Engineering Analysis and Numerical Methods

Module Registrar: Dr Christie Maddock christie.maddock@strath.ac.uk	**Taught To (Course): Cohorts for whom class is compulsory**	
Other Lecturers Involved:	**Credit Weighting: 10 [ECTS 5]**	**Semester: 1 and 2**
Compulsory class	**Academic Level: 1**	**Suitable for Exchange: N**

Module Format and Delivery (HOURS i.e., 1 credit = 10hrs of study):

Lecture	Tutorial	Laboratory	Groupwork	External	Online	Project	Assignments	Private Study	**Total**
16		20					30	34	100

Educational Aim

This module aims to teach the basic principles of programming (focused on MATLAB) and the solution of mathematical problems with numerical techniques. The second aim is to give a basic understanding of probability theory and statistics with applications and practical examples in the MATLAB environment.

Learning Outcomes

On completion of the module the student is expected to be able to:

LO1 Demonstrate understanding of the use of concepts and methods of statistics and probabilities, applied in engineering principles.

LO2 Demonstrate the ability to implement basic programming principles and develop effective algorithms in a MATLAB environment.

LO3 Demonstrate the ability to identify and implement appropriate numerical methods to solve specific mathematical problems.

LO4 Adopt a holistic and proportionate approach to the mitigation of cyber security and risks.

Syllabus

The module will teach the following:

Introduction to cybersecurity and ways to mitigate security risk

Semester 1:
Introduction to MATLAB; MATLAB as a calculator; MATLAB as a programming language; comparison with other programming languages.

Programming principles: variables and arrays; operators, expressions, and statements; algorithms, structured programming logic and flow diagrams; computer arithmetic and errors.

Fundamentals of programming in MATLAB: data types; input and output; functions and structures; parameters and variables; memory allocation.

Semester 2

Data presentation: frequency tables, histograms, mean, standard deviations, quartiles.

Mean and expected value, mean, variance. Sampling distributions, estimation, confidence intervals, t-distribution.

Estimation and hypothesis testing. Sampling, standard errors, confidence limits.

Probability theory and models. Random variables and probability distributions. Elementary distributions: Properties of distribution, central limit theorem

Mathematical methods: linear algebra, vectors & matrices.

Numerical Methods: solution of linear and nonlinear equations; numerical quadrature; interpolation.

Assessment of Learning Outcomes

Criteria

For each of the Module Learning Outcomes the following criteria will be used to make judgements on student learning:

LO1
C1 Students will be able to demonstrate the ability to identify appropriate statistical techniques for simple engineering problems.
C2 Students will be able to mathematical methods in statistics and probabilities and their role in a variety of problems in engineering

LO2
C1 Students will be able to demonstrate basic programming skills by the construction of flow charts to summarise key steps of a problem
C2 Students will construct MATLAB scripts to demonstrate the ability to implement numerical schemes based on the flow charts, to solve simple numerical problems.

LO3
C1 Students will be able to demonstrate a selection of an appropriate methods to solve a range of problem types.
C2 Students will demonstrate the ability to numerically solve problems in linear and non-linear algebra and calculus.

LO4
C1 Students will be able to demonstrate the ability to identify processes and controls measurement to protect online environments networks, devices, and data from cyber-attacks.
C2 Students will be able to identify types of cyberattacks and recovery strategies.

The standards set for each criterion per Module Learning Outcome to achieve a pass grade are indicated on the assessment sheet for all assessment.

Principles of Assessment and Feedback
(within Assessment and Feedback Policy at: https://www.strath.ac.uk/professionalservices/staff/policies/academic/)

Summative assessments: Coursework submissions will be returned with mark breakdown to allow the students to reflect on their performance.

Formal feedback: Automatically generated feedback for the coursework will be provided including the student's mark.

Informal feedback: Verbal feedback will be provided to the students during the lectures and tutorial sessions. Additional verbal feedback during the on-campus sessions will be given to support the provided coursework feedback. Written feedback will be given via myplace forum.

Assessment Method(s) Including Percentage Breakdown and Duration of Exams *(individual weightings)*

Examination				Coursework		Practical		Project	
Number	Month(s)	Duration	***Weighting***	Number	***Weighting***	Number	***Weighting***	Number	***Weighting***
1		60 min	70%	1	30%	1	P/F		
*LO 1, 3				* LO 2		LO4		*	

* *L/Os: Indicate which Learning Outcomes (L01, L02, etc) are to be assessed by exam/coursework/practical/project as required.*

Coursework / Submission deadlines (*academic weeks*):
Semester 1, Week 10

Resit Assessment Procedures:
Exam during the August resit diet

PLEASE NOTE:
Students need to pass the module on cyber security and gain a summative mark of 40% to pass the module. Students who fail the module at the first attempt will be reassessed during the August diet. This re-assessment will consist entirely of an exam. No marks from previous attempts will be transferred to new attempts.

Recommended Reading

****Highly recommended reading *Simply for reference (do NOT purchase)**

**1) Stormy Attaway, MATLAB: A Practical Introduction to Programming and Problem Solving

**2) T. Siauw, A. Bayen, An Introduction to MATLAB Programming and Numerical Methods for Engineers

*3) Thomas, G.B. & Finney, R.L. Calculus and Analytic Geometry, Addison-Wesley, ISBN: 0201400154.

*4) Kreyszig, E., Advanced Engineering Mathematics, Wiley, ISBN: 047133328X..

Additional Student Feedback
(Please specify details of when additional feedback will be provided)

Date	Time	Room No
Weekly tutorials		Check timetable webpages for details

Session: 2023/2024

Approved:

Course Director Signature: S Connolly (on behalf of E Henderson)

Date of Last Modifications: 21/09/2023

(Updated September 2023)

MODULE TIMETABLE

Module Code:	**ME108**	**Module Title:**	**Engineering Analysis and Numerical Methods**

Brief Description of Assessment: -
Coursework in semester 1 (30%), and an exam in semester 2 (70%)

Assessment Timing

Indicated on the table below are the start/submission dates for each assignment/project and the timing of each exam/assessment. Dropdowns may be left blank. Add extra notes below the dropdowns where relevant.

Please note: Timings can and will change, this should only be used as a guide.

Semester One	W&D Wk	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9	WK10	WK11	Exam Period
	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Course work Set	Choose an item. Choose an item.	Choose an item. Choose an item.	Course work Submit	Choose an item. Choose an item.	Choose an item.

Semester Two	C&D Wk	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9	WK10	WK11	Exam Period
	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Exam