ES2F3-15 Engineering Mathematics and Data Analytics

24/25

Department
> School of Engineering

Level
> Undergraduate Level 2

Module leader
> Elia Gironacci

Credit value
> 15

Module duration
> 24 weeks

Assessment
> 50% coursework, 50% exam

Study location
> University of Warwick main campus, Coventry

Description

Introductory description

ES2F3-15 Engineering Mathematics and Technical Computing

[Module web page](#)

Module aims

To build on the fundamental material introduced in Engineering Mathematics in Year 1 thereby ensuring that students are equipped with the necessary analytical and computational tools to tackle advanced material in modules taught in later years. To present and provide skills in the application of more advanced mathematics and systems modelling concepts. To develop skills in the use of MATLAB for modelling and analysis of engineering systems. To introduce computer programming concepts and develop programming skills within MATLAB.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

Applied linear algebra: linear matrix/vector equations and their solution (applications such as linear regression analysis, electrical circuits and fluid networks); eigenvalue/eigenvector analysis (applications such as oscillation in circuits, structural dynamics, solution of state variable models and stability analysis);

Data manipulation in MATLAB

Data analysis techniques: Regression, classification, PCA and design of experiments.

MATLAB as a system modelling and analysis tool.

Learning outcomes

By the end of the module, students should be able to:

- Recognise and apply advanced mathematical tools and techniques to solve engineering based problems.
- Develop complex mathematical models of engineering systems.
- Solve complex engineering problems using MATLAB.
- Apply data analytics techniques to datasets produced by engineering processes and systems.

Indicative reading list

Croft, A. and Davison, R., "Mathematics for Engineers: and MyMathLab: A Modern Interactive Approach", 3rd Ed., Pearson, ISBN-10: 1408263238, 2010.
James, G., "Modern Engineering Mathematics : 4th edition with MyMathLab", Pearson, ISBN-10: 027373413X, 2010.
Magrab, E.B. et al., "An Engineer's Guide to MATLAB: International Edition", 3rd Ed. Pearson, ISBN-10: 0137039549, 2010.

Subject specific skills

1. Plan and manage the design process, including cost drivers, evaluating outcomes, and working with technical uncertainty
2. Ability to apply relevant practical and laboratory skills

Transferable skills

1. Numeracy: apply mathematical and computational methods to communicate parameters, model and optimize solutions
2. Apply problem solving skills, information retrieval, and the effective use of general IT facilities
3. Overcome difficulties by employing skills, knowledge and understanding in a flexible manner

Study

Study time

Type	Required
Lectures	20 sessions of 1 hour (13%)
Practical classes	4 sessions of 2 hours (5%)
Work-based learning	50 sessions of 1 hour (33%)
Other activity	4 hours (3%)
Private study	68 hours (45%)
Total	150 hours

Private study description

110 hours guided independent learning (including VLE use and support from Employer)

Other activity description

2x1h of examples class
2X1h of revision class

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group C3

	Weighting	Study time
Data Analysis Assessment	50%	
Data Analysis Assessment (10 pages)		
Online Examination	50%	
QMP online Examination		
~Platforms - AEP,QMP		

- Online examination: No Answerbook required

Feedback on assessment

Advice and feedback are available on the lecture material and examination questions, via online web-forum based in module support Moodle pages.

[Past exam papers for ES2F3](#)

Availability

Courses

This module is Core for:

- Year 2 of DESA-H221 Undergraduate Civil and Infrastructure Engineering (Non-integrated Degree Apprenticeship)