WM272-15 Numerical Methods

25/26

Department
WMG
Level
Undergraduate Level 2
Module leader
Karen Kudar
Credit value
15
Module duration
14 weeks
Assessment
100% coursework
Study locations
University of Warwick main campus, Coventry Primary
Distance or Online Delivery

Description

Introductory description

This module builds on the fundamental mathematics introduced in the first-year engineering mathematics module (WM175), relevant to Degree Apprenticeship Standards ST0023, ST0024, ST0025 and ST0027, and provides a basis for advanced modules in the 3rd and 4th year of the Applied Professional Engineering Programme.

This module concentrates on fundamental numerical methods to provide the student with a range of alternate techniques with which to approach contextualised engineering/mathematical problems.

This module is linked with C1, C and, C3 of the AHEP 4.

LO1: C1, C2, C3
LO2: C1, C3
LO3: C2, C3
LO4: C1

Module web page

Module aims

This module aims to look at contextualised mathematical (i.e., engineering) problems and identify how to navigate the problem using their mathematical knowledge. Identify the mathematical tools that will be required to solve a problem and recognise their limitations. Apply appropriate mathematical tools correctly to produce a solution that is presented in a concise and comprehensive manner.

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.

- Numerical solutions of equations
- Eigenvalues and eigenvectors
- Approximating functions
- Numerical differentiation (including partial differentiation)
- Numerical solutions to differential equations.
- Numerical integration

Learning outcomes

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

- Formulate solutions that contain appropriate use of core mathematical notation, terminology and methods. [AHEP:4- C1]
- Critically appraise the limitations of the core mathematical methods and tools used. [AHEP:4- C2, C3]
- Examine a variety of core numerical methods to investigate contextualised problems. [AHEP:4- C1, C2, C3]
- Demonstrate the interdependent nature of analytical and numerical mathematical concepts. [AHEP:4- C1, C3]

Indicative reading list

Croft, A., Davison, R., Engineering Mathematics. 5th edition. Pearson 2019. ISBN: 1292253649, 9781292253640

Stroud K.A., Booth D.J. Engineering Mathematics. 7th edition. Palgrave Macmillan 2013. ISBN: 1137031204, 9781137031204

Engineering Mathematics Through Applications, Kuldeep Singh, 2nd edition. Palgrave Macmillan 2011. ISBN: 023027479X, 9780230274792

MATLAB for Engineers, Holly Moore. 5th edition. Pearson 2019. ISBN: 1292231203, 9781292231204

View reading list on Talis Aspire

Subject specific skills

1. Select, use and apply approved problem-solving methods to solve complex problems and determine appropriate solutions or actions (S2 in all standards).
2. Interpret and produce technical documentation such as engineering reports or data analytics (S4 in all standards).
3. Observe, record and draw accurate and auditable conclusions from data and/or developmental or test evidence (S5 in all standards).
4. Identify resources, such as digital tools or technologies, human, equipment, materials or data, to complete design and development projects or programmes of work (S9 in ST0024, ST0025; S8 in ST0027).

Transferable skills

- Problem solving: use rational and logical reasoning to deduce appropriate and well-reasoned conclusions, retain an open mind, optimistic of finding solutions, thinking laterally and creatively to look beyond the obvious, knows how to learn from failure.
- Professionalism: prepared to operate autonomously, aware of how to be efficient and resilient, manages priorities and time, self-motivated, setting and achieving goals, prioritising tasks.
- Critical thinking: recognises patterns, themes and key messages from sometimes confused and incomplete data, make informed decisions on the value of a range of sources allowing an evidence based conclusion based on this analysis.
- Digital literacy: has the capabilities that enable living, learning and working in a digital society, comfortable with using digital media to communicate, solve problems, manage information, collaborate, create and share content.
- Communication: written - present arguments, knowledge and ideas, in a range of formats, active listening - questioning, reflecting, summarising.
- Ethical values: committed to living ethically and behaving consistent with the Warwick Guiding Principles.

Study

Study time

Type	Required
Lectures	5 sessions of 1 hour (3%)
Seminars	10 sessions of 1 hour (7%)
Online learning (scheduled sessions)	15 sessions of 1 hour (10%)
Online learning (independent)	5 sessions of 1 hour (3%)
Other activity	5 hours (3%)
Total	150 hours

Type	Required
Private study	50 hours (33%)
Assessment	60 hours (40%)
Total	150 hours

Private study description

The students will complete technology, solution formatting and mathematical resilience elements. Recapping of prior learning is expected where necessary.
Reading around the topics covered will provide the depth of understanding required to complete the course to a good standard. This may be both prior to and/or after the teaching and learning sessions.
Support from teaching staff is available.

Other activity description

On-line support / consultancy before assessment deadlines.

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group A2

	Weighting	Study time	Eligible for self-certification
Assessment 1 (Problem Sets/Coursework)	40%	24 hours	Yes (extension)
Mathematical problem sets with individualised questions requiring critical analysis of results found and covering core methods. Assessment of written communication of mathematical solutions/decision making. Number of words is not relevant as calculations will be submitted but a maximum length of 15 sides of A4 will be stipulated.			
Assessment 2 (Problem Sets/Coursework)	60%	36 hours	Yes (extension)
Problem sets within engineering contexts to be solved fully by students, showing a critical analysis of the core methods and tools used as well as knowledge of the interdependent nature of taught mathematical concepts. Number of words not relevant as calculations will be submitted but a maximum of 25 sides of A4 will be stipulated.			

Feedback on assessment

Formative Feedback:

- Verbal formative feedback given during seminar/tutorial sessions.

Summative Feedback:

- Written Individual feedback on Assessment 1 (Individualised Problem Sets/Coursework).
- Written Individual feedback on Assessment 2 (Individualised Problem Sets/Coursework).

Availability

Courses

This module is Core for:

- Year 2 of UWMS-H7C3 Undergraduate Applied Professional Engineering (Control/Technical Support Engineer)
- Year 2 of UWMS-H7C2 Undergraduate Applied Professional Engineering (Electrical/Electronic Support Engineer)
- Year 2 of DWMS-H7C6 Undergraduate Applied Professional Engineering (Electrical/Electronic Support Engineer) (Degree Apprenticeship)
- Year 2 of UWMS-H7C1 Undergraduate Applied Professional Engineering (Manufacturing Engineer)
- Year 2 of DWMS-H7C5 Undergraduate Applied Professional Engineering (Manufacturing Engineer) (Degree Apprenticeship)
- Year 2 of UWMS-H7C4 Undergraduate Applied Professional Engineering (Product Design and Development Engineer)
- Year 2 of DWMS-H7C8 Undergraduate Applied Professional Engineering (Product Design and Development Engineer) (Degree Apprenticeship)
- Professional Applied Engineering