WM272-15 Numerical Methods

22/23

Department
WMG
Level
Undergraduate Level 2
Module leader
Karen Kudar
Credit value
15
Module duration
13 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) 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.

Module web page

Module aims

To understand the concepts and appreciate the limitations of numerical models and their application to engineering problems. It is also to gain an appreciation of the advantages and drawbacks of mathematical techniques in order to develop an overview in engineering and industrial applications.

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.

- The use of technology in mathematical problems.
- Numerical solutions of equations
- Calculus II - quadrature / numerical differentiation
- Error analysis
- Numerical solutions to IVPs in differential equations.
- Calculus III - partial derivates & total derivative

Learning outcomes

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

- Know and demonstrate understanding of the underlying principles of numerical solutions to equations including well-established models.
- Make appropriate use of technology to implement and verify numerical calculations.
- Apply the concepts of numerical approximation and appreciate the limitations of the modelling.
- Evaluate critically the appropriateness of numerically calculated approximations.

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

Communication of mathematical knowledge.
Describing an engineering problem mathematically.
Breaking a contextualised problem down into smaller parts.
Quantitative reasoning.

Transferable skills

Analytical skills
Problem solving

Resilience
Time management
Critical thinking
Creativity
Intellectual rigour

Study

Study time

Type	Required	Optional
Lectures	6 sessions of 1 hour (4%)	
Seminars	8 sessions of 1 hour (5%)	
Tutorials	6 sessions of 1 hour (4%)	
Online learning (scheduled sessions)	19 sessions of 1 hour (13%)	6 sessions of 1 hour
Online learning (independent)	1 session of 5 hours (3%)	
Private study	46 hours (31%)	
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 but students will be expected to increasingly develop their independent learning skills.
Time spent on preparation for assessments is required - advice regarding this will be given.

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group A

	Weighting	Study time	Eligible for self-certification
Assessment 1	30%	18 hours	Yes (extension)
Problem set covering material from week 1.			
Assessment 2	70%	42 hours	Yes (extension)
Problems including within engineering contexts to be solved fully by students using numerical methods and with adequate error analysis. Number of words not relevant as calculations will be submitted but a maximum of 12 sides of A4.			

Feedback on assessment

Assessment 1 (In-class test): Written cohort-level feedback given after the test.
Assessment 2 (Problem set): Marked script with individual feedback returned.

Availability

Courses

This module is Core for:

- Year 2 of UWMS-H7C3 Undergraduate Applied Professional Engineering (Control/Technical Support Engineer)
- Year 2 of DWMS-H7C7 Undergraduate Applied Professional Engineering (Control/Technical Support Engineer) (Degree Apprenticeship)
- 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)