FP007-30 Mathematics for Science

21/22

Department
Warwick Foundation Studies
Level
Foundation
Module leader
Felix Mayeya
Credit value
30
Module duration
25 weeks
Assessment
40% coursework, 60% exam
Study location
University of Warwick main campus, Coventry

Description

Introductory description

This module covers the essential ideas and techniques that underpin university-level study mathematical subjects such as physics and engineering. It covers a range of fundamental topics – including calculus, vectors, matrices and complex numbers.

Module web page

Module aims

To develop the students understanding of mathematics and mathematical processes to enable progression onto a range of undergraduate degree programmes.
To develop an understanding of how mathematics can be used in different areas of study and to use mathematics as an effective means of communication.

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.

Functions and their graphs
Domain, range, composite functions, inverse functions, curve sketching including asymptotes,

simple transformations of functions f(x-a), f(ax), f(x)-a, af(x).

Algebra
Polynomials, rational functions, partial fractions.

Exponentials and logarithms
Function e^x and its graph, function ln x and its graph, solutions of the equations of the form a^x=b, exponential growth and decay of rate of change, second order derivatives, exponential models.

Statistics
Exploring, presenting and summarising data, probability, correlation and regression.

Sequences and series
Arithmetic and geometric series sum to n terms, sum to infinity, applications of series, binomial expansion

Trigonometry
Sine, cosine tangent rules and functions, radian measurement, secant, cosecant, cotangent, arcsin, arcos and arctan, use of standard trigonometric functions, proof and applications of trigonometric identities, solution of trigonometric equations in a given interval.

Differentiation
Derivative of f(x) as the gradient of the tangent to the graph of y=f(x) interpretation, differentiation of x^n and related sums and differences, differentiation of e^x, lnx, sinx, cosx, tanx and their sums and differences. Application of differentials to gradients, tangents and normals, maxima and minima, stationary points, increasing and decreasing functions. Product rule, quotient rule, chain rule, implicit and parametric differentiation.

Integration
Indefinite integration as the reverse of integration, integration of x^n, e^x, 1/x, sinx, cosx, tanx. Interpretation of definite integrals, integral as area under a curve, evaluation of definite integrals, volume of revolution, integration by substitution, and parts, partial fractions, solution of first order differential equations.

Numerical methods
Location of roots of f(x)=0 by consideration of changes of sign, approximate solution of equations using simple iterative methods including x_(n+1)=f(x_n), numerical integration of functions.

Matrices
Addition, subtraction and multiplication, determinants (2x2 matrix and 3x3 matrix), inverse (2x2 matrix), solving 2x2 systems of linear equations using the inverse matrix method, solutions of simultaneous equations using Cramer's rule (2x2 and 3x3).

Vectors
Vectors in two and three dimensions, magnitude of a vector, algebraic operations of vector addition and multiplication by scalars and their geometric interpretations, position vectors, distance between two points, vector equations of lines and planes, scalar (dot) product and its applications to calculation of angles.

Complex numbers

Conversion between Cartesian, polar and exponential forms, Argand diagram, De Moivre's theorem and its applications.

Learning outcomes

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

- Demonstrate a good understanding of the mathematical principles and processes by choosing and applying appropriate mathematical tools and techniques to a variety of contexts.
- Construct, justify and present mathematical arguments through logical reasoning and deductions.
- Use of precise statements involving correct use of symbols and appropriate mathematical language.
- Analyse and interpret results obtained from the applications of mathematics to the solutions of real world problems in the sciences and engineering.

Indicative reading list

- Stewart, J. et al. (2016). Precalculus: mathematics for calculus. Boston: Cengage Learning.
- Sadler, A.J. and Thorning, D.W.S. (1987). Understanding pure mathematics. Oxford: Oxford University Press
- Stroud K. A. and Booth D. J. (2013). Engineering Mathematics. Basingstoke: Palgrave Macmillan.
- Jordan, S., Ross, S. and Murphy, P. (2012). Mathematics for Science. Oxford University Press.
- Stewart, J. (2012). Calculus. Belmont: Brooks/Cole Pub Co

View reading list on Talis Aspire

Subject specific skills

- construct and present mathematical and logical arguments;
- develop advanced numeracy skills;
- understand, interpret and extract information from data presented in various forms;
- convert real-world problems into mathematical problems;
- state a problem, break it down into sub-problems and clearly present solutions using appropriate symbols and terms.

Transferable skills

No transferable skills defined for this module.

Study

Study time

Type	Required
Seminars	25 sessions of 3 hours (25%)
Other activity	25 hours (8%)
Private study	200 hours (67%)
Total	300 hours

Private study description

Students are expected to watch seminar preparation videos prior to each session, review seminar work after the sessions, and also complete the series of Independent Study Questions provided on Moodle.

Other activity description

online learning (unscheduled sessions)

Costs

No further costs have been identified for this module.

Assessment

You do not need to pass all assessment components to pass the module.

Assessment group D2

	Weighting	Study time
Problem Set	10%	

A collection of problems set throughout the year.

Class Test 1	15%	

File-based open book assessment - Students will access the assessment and be required to upload the photos/scans of their written work through the Warwick University Examination Portal or another virtual learning platform.

Class Test 2	15%	

File-based open book assessment - Students will access the assessment and be required to upload the pictures of their written work through the Warwick University Examination Portal Students will access the assessment and be required to upload the photos/scans of their written work through the Warwick University Examination Portal or another virtual learning platform..

	Weighting	Study time
On-campus Examination	60%	

Students will access examination paper and be required to upload the pictures of their written work through the Warwick University Examination Portal Students will access the assessment and be required to upload the photos/scans of their written work through the Warwick University Examination Portal or another virtual learning platform..

- Answerbook Pink (12 page)
- Students may use a calculator

Feedback on assessment

Feedback is provided to students through written comments on scripts. Students receive a copy (or an e-copy) of their assessments with comments indicating where marks are lost and/or gained. Students attend one to one feedback sessions or request an e-meeting where strengths and weaknesses are addressed.

Past exam papers for FP007

Availability

Courses

This module is Core for:

- FIOE Warwick International Foundation Programme
  - Year 1 of FP19 Warwick International Foundation Programme - Engineering
  - Year 1 of FP20 Warwick International Foundation Programme - Physical Sciences
  - Year 1 of FP12 Warwick International Foundation Programme - Science and Engineering