FP020-30 Pure Mathematics

20/21

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

Description

Introductory description

FP020-30 Pure Mathematics

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.

1. Outline Syllabus
   Introduction to Mathematical logic

- Logical connectives.

- Truth tables and equivalent statement.
- Definition of a proof.
- Proofs by contradictions.

  Sets, Functions and Number systems
- Number systems.
- Natural numbers, Rational numbers and Real numbers.
- Mathematical Induction.
- Basic Set Theory: Unions and Intersections of sets. Venn Diagrams and De Morgan laws. Cartesian Products and Power sets.
- Functions. Domains, codomains and ranges. Injective, surjective and bijective functions. Inverse functions. Graphs of functions.
- The modulus function and its properties.

  Polynomials and Rational Functions
- Polynomials.
- Multiplication and long division of polynomials.
- The remainder theorem and the factor theorem. Solution of quadratic cubic equations and equations involving higher order polynomials.

  Curves Sketching
- Sketching curves and graphs of functions defined by polynomials and rational functions.
- Sketching graphs involving the modulus function.
- Transformations of graphs: Translation, stretches and reflections. Symmetries.
- Solution of inequalities involving rational functions and the modulus function.

  Coordinate Geometry in 2- and 3-Dimensions
- Equation of a straight line.
- Equation of circle.
- Parametric equations of curves.
- Equation of a plane.
- Intersection of line and curve.
- Equations of tangents and normals.
- Parabolas. Ellipses. Hyperbolas.

  Sequences and Series
- Arithmetic and geometric series sum to n terms, sum to infinity.
- Binomial expansion.

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  Trigonometry
- Sine, cosine, tangent functions.
- Triangles and area.
- Sine rule and cosine rule.
- Radian measurement.
- Reciprical and inverse trigonometric functions.
- Graphs of trigonometric functions.
- Trigonometric identities. Addition formulae.
- Solution of trigonometric equations in a given interval.

  Exponentials and Logarithms
- Log_a (x) and its relation to a^x.
- Properties of exponentials and logarithms.

- Solutions to equations of the form a^x=b.
- The function e^x, ln x and their graphs.
- Exponential growth and decay
  Differentiation
- Derivative of f(x) as the gradient of the tangent to the graph of y=f(x).
- Derivatives of x^n, e^x, ln x, and trigonometric functions.
- Sum rule, products rule, quotient rule, chain rule.
- Application of differentiation to gradients, tangents and normals, maxima and minima, stationary points, increasing and decreasing functions.
- Implicit and parametric differentiation.
  Integration
- Indefinite integration as the reverse of integration.
- Definite integrals and relation to area under graph.
- Fundamental theorem of calculus.
- Integrals of x^n, e^x, 1/x, sin x, cos x.
- Evaluation of definite integrals.
- Volume of revolution.
- Integration by substitution, parts, and partial fractions.
  Differential Equations
- Formation of simple differential equations.
- Rates of growth.
- Solution of first order equations by separation of variables.
  Complex Numbers
- Basic arithmetic.
- Argand diagram.
- Polar form. Exponential form.
- de Moivre's theorem.
- Roots of polynomials.
  Application to trigonometric identities

Learning outcomes

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

- Demonstrate competence in mathematical reasoning skills, and in tackling the mathematical principles and processes to enable progression onto an undergraduate degree course.
- Construct and present mathematical arguments through appropriate use of logical deduction and precise statements involving correct use of symbols and appropriate mathematical language.
- Identify, formulate, abstract, and solve mathematical problems that use tools from a variety of mathematical areas, including algebra, analysis, Calculus, and differential and Geometry.
- Use mathematical principles in the analysis and solution of real- world problems in the sciences and engineering.

Indicative reading list

1. Calculus Concepts and Methods. Authors: Ken Binmore and Joan Davies.
   Cambridge University Press 2001.
2. Introducing Pure Mathematics. Author: Robert Smedley
   Oxford University Press 2001.

Subject specific skills

Develop students ability to propound correct logical mathematical arguments and to be able to identify valid and invalid propositions.

Transferable skills

Mathematics for use in IRS, Economics, Computer Science.
Basics of logic for use in SPAMM, Computer Science.

Study

Study time

Type	Required
Seminars	75 sessions of 1 hour (25%)
Online learning (independent)	25 sessions of (0%)
Private study	185 hours (62%)
Assessment	40 hours (13%)
Total	300 hours

Private study description

Private Study, practice of topic, revising of lecture materials.

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 D1

	Weighting	Study time
Short answer and MCQs 3	15%	10 hours
Short answer and MCQs 1	10%	5 hours
Short answer and MCQs 2	15%	10 hours
On-campus Examination	60%	15 hours

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

Feedback on assessment

(i) Written feedback delivered via tabula.
(ii) Generic feedback in a seminar.
(iii) Face to face feedback.

Past exam papers for FP020

Availability

Courses

This module is Core for:

- FIOE Warwick International Foundation Programme
    - Year 1 of FP18 Warwick International Foundation Programme - Computer Science
    - Year 1 of FP17 Warwick International Foundation Programme - Economics
    - Year 1 of FP13 Warwick International Foundation Programme - Mathematics and Economics
    - Year 1 of FP16 Warwick International Foundation Programme - Mathematics and Statistics