MODULE TITLE	Mathematical Methods	**CREDIT VALUE**	30
MODULE CODE	MTH1002	**MODULE CONVENER**	Dr Layal Hakim (Coordinator)

DURATION: TERM	**1**	**2**	**3**
DURATION: WEEKS	11	11	0

Number of Students Taking Module (anticipated)	200

DESCRIPTION - summary of the module content

During your mathematics degree, you will be solving problems and proving theories in several branches of mathematics such as in pure mathematics, in applications to science and engineering, and in statistics. Inevitably you need to be able to calculate. That is what gives the mathematics its great power. This module covers developed bodies of useful techniques as a toolkit of common knowledge. It brings emphasis on the techniques rather than the applications of the techniques. Such techniques will enable you to deepen your familiarity with, and generalise, methods that you have seen at school level mathematics. This module will study topics that include the geometry of conic sections, properties of functions such as continuity and differentiability, differential and integral calculus, limits and convergence of sequences and series including Power Series and Taylor Series. The module also develops the fundamentals of vector and matrix theory, multivariate calculus, and the classification of various types of differential equations as well as analytical methods for solving them. The material in this module provide intuition for, and examples of, many of the mathematical structures that will be discussed in the module MTH1001 Mathematical Structures, and supply a firm understanding of methods required in future modules in the mathematics degree. In particular, it develops methods that underpin the modules MTH2003 Differential Equations and MTH2004 Vector Calculus and Applications.

AIMS - intentions of the module

This module aims to develop your skills and techniques in calculus, geometry and algebra. It is primarily focused on developing methods and skills for accurate manipulation of the mathematical objects that form the basis of much of an undergraduate course in mathematics. Whilst the main emphasis of the module will be on practical methods and problem solving, all results will be stated formally and each sub-topic will be reviewed from a mathematically rigorous standpoint. The techniques developed in this course will be essential for much of your undergraduate degree programme, particularly the second-year streams of Analysis, Differential Equations & Vector Calculus, and Mathematical Modelling.

INTENDED LEARNING OUTCOMES (ILOs) (see assessment section below for how ILOs will be assessed)

On successful completion of this module, ***you should be able to:***
Module Specific Skills and Knowledge:
1 explain how techniques in differential and integral calculus are underpinned by formal rigour;
2 apply techniques in geometry and algebra to explore three dimensional analytic geometry;
3 perform accurate manipulations in algebra and calculus of several variables using a variety of standard techniques;
4 solve some specific classes of ordinary differential equations;
Discipline Specific Skills and Knowledge:
5 demonstrate a basic knowledge of functions, sequences, series, limits and differential and integral calculus necessary for progression to successful further studies in the mathematical sciences;
Personal and Key Transferable/ Employment Skills and Knowledge:
6 reason using abstract ideas, and formulate and solve problems and communicate reasoning and solutions effectively in writing;
7 use learning resources appropriately;
8 exhibit self-management and time-management skills.

SYLLABUS PLAN - summary of the structure and academic content of the module

- Geometry: lines; planes; conic sections;

- Functions: single- and multivariate; limits; continuity; intermediate value theorem;

-Complex numbers

- Sequences: algebra of limits; L'Hopital's rule

- Series: convergence/divergence tests; power series;

- Differential calculus: simple and partial derivatives; Leibniz' rule; chain rule; Taylor approximation; implicit differentiation; minima and maxima;

- Integral calculus: substitution; integration by parts; multiple integrals; applications;

- Differential equations: linear and separable ordinary DEs; basic partial DEs;

- Vectors, matrices: Gaussian elimination; transformations; eigenvalues/eigenvectors.

LEARNING AND TEACHING

LEARNING ACTIVITIES AND TEACHING METHODS (given in hours of study time)

Scheduled Learning & Teaching Activities	76.00	**Guided Independent Study**	224.00	**Placement / Study Abroad**

DETAILS OF LEARNING ACTIVITIES AND TEACHING METHODS

Category	Hours of study time	Description
Scheduled Learning and Teaching Activities	66	Lectures
Scheduled Learning and Teaching Activities	10	Tutorials
Guided Independent Study	224	Studying additional recordings complementing lectures and reading material, examples sheets and revision

ASSESSMENT

FORMATIVE ASSESSMENT - for feedback and development purposes; does not count towards module grade

Form of Assessment	Size of Assessment (e.g. duration/length)	ILOs Assessed	Feedback Method
Exercise sheets	10 x 10 hours	All	Annotated scripts with oral feedback from tutor
Mid-Term Tests	2 x 1 hour	All	Feedback on marked sheets, class feedback

SUMMATIVE ASSESSMENT (% of credit)

Coursework	0	Written Exams	100	Practical Exams	

DETAILS OF SUMMATIVE ASSESSMENT

Form of Assessment	% of Credit	Size of Assessment (e.g. duration/length)	ILOs Assessed	Feedback Method
Written Exam A - Closed book (Jan)	50	2 hours	All	Via SRS
Written Exam B - Closed book (May)	50	2 hours	All	Via SRS

DETAILS OF RE-ASSESSMENT (where required by referral or deferral)

Original Form of Assessment	Form of Re-assessment	ILOs Re-assessed	Time Scale for Re-reassessment
Written Exam A - Closed Book	Written exam (50%, 2hr)	All	August Ref/Def Period
Written Exam B - Closed Book	Written Exam B (50%, 2hr)	All	August Ref/Def Period

RE-ASSESSMENT NOTES

In the case of module referral, the higher of the original assessment and the reassessment will be recorded for each component mark. In the case of module referral, the final mark for the module reassessment will be capped at 40%..

RESOURCES

INDICATIVE LEARNING RESOURCES - The following list is offered as an indication of the type & level of information that you are expected to consult. Further guidance will be provided by the Module Convener

Basic reading: Any A-Level on mathematics and further mathematics
ELE: http://vle.exeter.ac.uk
Reading list for this module:

Type	Author	Title	Edition	Publisher	Year	ISBN	Search
Set	Finney, R.L., Maurice, D., Weir, M. and Giordano, F.R.	Thomas' Calculus based on the original work by George B. Thomas, Jr.	10th or later	Addison-Wesley	2003	000-0-321-11636-4	[Library]
Set	Stewart, J.	Calculus	5th	Brooks/Cole	2003	000-0-534-27408-0	[Library]
Set	McGregor, C., Nimmo, J. & Stothers, W.	Fundamentals of University Mathematics	2nd	Horwood, Chichester	2000	000-1-898-56310-1	[Library]
Set	Tan, Soo T.	Calculus	International edition	Brooks/Cole Cengage Learning	2010	978-0495832294	[Library]
Set	Tan, Soo T.	Calculus: Early Transcendentals	International edition	Brooks Cole/Cengage Learning	2010	978-1439045992	[Library]

CREDIT VALUE	30	ECTS VALUE	15

PRE-REQUISITE MODULES	None
CO-REQUISITE MODULES	None

NQF LEVEL (FHEQ)	4	AVAILABLE AS DISTANCE LEARNING	No
ORIGIN DATE	Tuesday 10 July 2018	LAST REVISION DATE	Tuesday 12 October 2021

KEY WORDS SEARCH	Calculus; geometry; conic sections; functions; continuity; sequences; limits; series; convergence; divergence; differentiation; integration; differential equations; vectors; matrices; Gaussian elimination; eigenvalues; eigenvectors