MODULE TITLE	**Number Theory**	**CREDIT VALUE**	**15**
MODULE CODE	**MTH3004**	**MODULE CONVENER**	**Dr Christopher Lazda (Coordinator)**

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

Number of Students Taking Module (anticipated)	**100**

DESCRIPTION - summary of the module content

Number theory is a vast and fascinating field of mathematics, consisting of the study of the properties of whole numbers. From this module, you will acquire a working knowledge of the main concepts of classical elementary number theory. This will be developed as a rigorous proof-based theory along with some appreciation of the theory behind modern computational techniques. Topics studied include divisibility properties of natural numbers, congruences, prime numbers, primality and factorisation, quadratic reciprocity, sums of squares and Fermat's last theorem for the special case of sums of fourth powers.
Prerequisite module: MTH2002 or MTH2010, or equivalent

AIMS - intentions of the module

This course covers one of the oldest and most popular areas of mathematics, building on basic ideas and including modern applications. The dual objectives are to provide a solid foundation for further work in number theory, but also at the same time to give a self-contained interesting course suitable as an end in itself, with modern answers to ancient problems and modern applications of classical ideas. You will acquire a sound foundation in number theory from a modern perspective.

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 demonstrate a working knowledge of the main concepts of classical elementary number theory, together with some appreciation of modern computational techniques.

Discipline Specific Skills and Knowledge:
2 understand the role of Number Theory as a central topic in mathematics, and demonstrate an awareness of some of its modern applications;

Personal and Key Transferable/ Employment Skills and Knowledge:
3 show enhanced problem-solving skills and ability to formulate your solutions as mathematical proofs;
4 reveal a fundamental knowledge of Number Theory from a modern perspective.

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

divisibility, greatest common divisor;
extended Euclidean algorithm, prime numbers and unique factorisation;
modular arithmetic, Euler's and Wilson's theorems, Chinese Remainder Theorem;
polynomial congruences, Hensel lifting;
primitive roots;
quadratic residues and quadratic reciprocity;
sums of two and four squares;
Pythagorean triples;
Fermat's Last Theorem for exponent four.

LEARNING AND TEACHING

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

Scheduled Learning & Teaching Activities	33.00	**Guided Independent Study**	117.00	**Placement / Study Abroad**	0.00

DETAILS OF LEARNING ACTIVITIES AND TEACHING METHODS

Category	Hours of study time	Description
Scheduled Learning and Teaching Activities	33	Lectures/example classes
Guided Independent Study	117	Guided independent study

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
Coursework – example sheets	Variable	All	Written and verbal

SUMMATIVE ASSESSMENT (% of credit)

Coursework	20	**Written Exams**	80	**Practical Exams**	0

DETAILS OF SUMMATIVE ASSESSMENT

Form of Assessment	% of Credit	Size of Assessment (e.g. duration/length)	ILOs Assessed	Feedback Method
Coursework 1 – based on questions submitted for assessment	10	15 hours	All	Annotated script and written/verbal feedback
Coursework 2 - based on questions submitted for assessment	10	15 hours	All	Annotated script and written/verbal feedback

Form of Assessment	% of Credit	Size of Assessment (e.g. duration/length)	ILOs Assessed	Feedback Method
Written Exam - closed book	80	2 hours (Summer)	All	Written/verbal on request, 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*	Written Exam (2 hours)	All	August Ref/Def Period
Coursework 1*	Coursework 1	All	August Ref/Def Period
Coursework 2*	Coursework 2	All	August Ref/Def Period

*Please refer to reassessment notes for details on deferral vs. Referral reassessment

RE-ASSESSMENT NOTES

Deferrals: Reassessment will be by coursework and/or written exam in the deferred element only. For deferred candidates, the module mark will be uncapped.
Referrals: Reassessment will be by a single written exam worth 100% of the module only. As it is a referral, the mark 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

ELE – http://vle.exeter.ac.uk
Reading list for this module:

Type	Author	Title	Edition	Publisher	Year	ISBN	Search
Set	Rose H.E.	A Course in Number Theory		Oxford University Press	1994	000-0-198-53261-X	[Library]
Set	Burn R.P.	A Pathway into Number Theory	2nd	Cambridge University Press	1997	000-0-521-57540-0	[Library]
Set	Niven I. & Zuckerman H.S. & Montgomery H.L.	An Introduction to the Theory of Numbers	5th	Wiley	1991	000-0-471-54600-3	[Library]
Set	Rosen K.H.	Elementary Number Theory and its Applications		Addison-Wesley	2005	000-0-201-57889-1	[Library]

CREDIT VALUE	15	**ECTS VALUE**	7.5
PRE-REQUISITE MODULES	MTH2002, MTH2010		
CO-REQUISITE MODULES			
NQF LEVEL (FHEQ)	6	**AVAILABLE AS DISTANCE LEARNING**	No
ORIGIN DATE	Tuesday 10 July 2018	**LAST REVISION DATE**	Thursday 26 January 2023
KEY WORDS SEARCH	Number theory; prime numbers; divisibility; quadratic reciprocity; congruences; sums of squares; crytography.		