F18PA Pure Mathematics A

COURSE DETAILS
Course Code: F18PA
Full Course Title: Pure Mathematics A
SCQF Level: 8
SCAF Credits: 15
Available as Elective: No

DELIVERY LEVEL
Undergraduate: Yes
Postgraduate Taught: Yes
Postgraduate Research: No

COURSE AIMS
To offer an introduction to the ideas of number theory and geometry to students specialising in Mathematics.

To exploit technical know-how gained at SCQF level 7 to develop theoretical ideas in a concrete setting.

To offer further insights into Mathematical reasoning and the art of proof.

LEARNING OUTCOMES – SUBJECT MASTERY
By the end of the course, students should be able to:

- understand the arithmetic and order properties of Z
- understand the properties of the divisibility relation on Z
- carry out the Euclidean algorithm to find greatest common divisors
- find Pythagorean triples and understand their classification
- understand the Fundamental Theorem of Arithmetic
- find prime numbers using a sieve method
- prove that there are infinitely many primes
- understand qualitative facts about the distribution of primes
- find primes in certain families
- understand congruence as an equivalence relation on Z
- solve linear and simultaneous congruences
- understand the properties of Euler's φ–function
- understand the notion of a plane isometry or motion and their basic properties
- work with the matrix representation of plane isometries
- classify a given plane isometry

LEARNING OUTCOMES – PERSONAL ABILITIES

- Demonstrate the ability to learn independently
- Demonstrate knowledge of an area of mathematics.
- Manage time, work to deadlines and prioritise workloads
Communicate mathematical reasoning orally and in writing

Use of mathematical software

SYLLABUS


Prime numbers: Factorisation in Z. Primes and their distribution. Fermat and Mersenne primes.

Pythagorean triples: Classification of Pythagorean triples.

Congruences: Congruence as an equivalence relation. Solution of linear and simultaneous congruences.

Multiplicative functions: Summing over divisors, Euler's totient function, Fermat and Euler theorems, applications to cryptography.

Irrational numbers: Irrational, algebraic and transcendental numbers. Countable sets. Diophantine approximation.

Transformation geometry: Classification of plane isometries and their elementary properties.

COURSE RELATIONSHIPS

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<th>School</th>
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LOCATION AND ASSESSMENT METHODS

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