COURSE DETAILS
Course Code: F17SC
Full Course Title: Discrete Mathematics
SCQF Level: 7
SCAF Credits: 15
Available as Elective: Yes

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

COURSE AIMS
The goal of the course is to explain the basic techniques of discrete mathematics which are used in computer science.

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

- Understand the basic terminology of set theory, graph theory, linear algebra and probability theory
- Understand how formal mathematical objects like sets, graphs, matrices, recurrence relations arise in computer science related problems
- Solve elementary counting problems,
- Solve systems of linear equations
- Apply graph algorithms
- Solve simple recurrence relations
- Compute probabilities
- Appreciate the power of mathematical formalisation, facilitated by the use of precise definitions and notations, in solving practical problems.
- Appreciate the value of careful, quantitative reasoning in analysing problems related to computer science and to recognise that the outcome of such reasoning can defy naive intuition

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

SYLLABUS
F17SC Discrete Mathematics

Probability Theory: Probability Space, Conditional Probability, Independence and Bayes' Theorem, Random Variables and Distributions, Expected Value, Variance, Examples of applications to algorithms

Graph Theory 1: Introduction to graphs, Basic graph terminology, Adjacency Matrices, Paths and connectivity, Connected components, Shortest path problems in weighted graphs, Dijkstra's Algorithm.

Graph Theory 2: Trees and spanning trees, Breadth-first search, Kruskal's and Prim's Algorithms for a minimal spanning tree, Euler and Hamilton paths, Fleury's Algorithm for constructing Euler circuits, Estimates for Hamilton circuits.

Recurrence Relations: Solving problems by iteration, First and second order recurrence relations, Recurrences in Algorithms

Matrices and Linear Transformations: Linear equations and elementary row operations, Elementary matrices and Gaussian elimination, Echelon matrices, Eigenvectors and eigenvalues, Dia

COURSE RELATIONSHIPS

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LOCATION AND ASSESSMENT METHODS

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