***Graphs, networks and design* (MT365)** content listing

Introduction	General overview, taster to the module
Graphs 1 *Graphs and digraphs*	Graphs, Eulerian and Hamiltonian graphs, digraphs, matrix representations of graphs
Networks 1 *Network flows*	Connected graphs and digraphs, Menger's theorem, flows in networks, max-flow min-cut theorem, algorithms for maximum flows
Design 1 *Geometric design*	Dimension, convexity; planar geometric arrangements: bricks, tilings, polygonal animals; Polyhedra; Incidence structures
Graphs 2 *Trees*	Tree structure, counting trees (labelled, binary and chemical trees), spanning sets and minimum/maximum connector problems, travelling salesman problem, cut trees, Gomory-Hu algorithm
Networks 2 *Optimal paths*	Algorithms using adjacency matrices, optimal path algorithms, critical path analysis, scheduling problems
Design 2 *Kinematic design*	Kinematic structure, braced rectangular frameworks, kinematic freedom and constraint; planar kinematic systems, mobility criteria
Graphs 3 *Planarity and colouring*	Euler's formula, Kuratowski's theorem, testing for planarity, colouring maps and the four-colour theorem, vertex and edge colouring algorithms
Networks 3 *Assignment and transportation*	Matching problems: Marriage problems, maximum matchings; Hungarian algorithms for assignment problems and transportation problems
Design 3 *Design of codes*	Error detection and correction; linear codes; cyclic codes, dual codes, extended codes; First-order Reed-Muller codes
Graphs 4 *Graphs and computing*	Efficiency of algorithms, stack and list data types, sorting algorithms, binary trees and depth-first / breadth-first search algorithms, quad trees, branch-and-bound methods for Knapsack problem and travelling salesman problem
Networks 4 *Physical networks*	Modelling physical networks; electrical networks, Kirchhoff's laws, Tellegen's theorem, solving electrical network equations
Design 4 *Block designs*	Block designs in experiments; balanced designs; Steiner triple systems, finite projective planes, Latin square designs; resolvable designs, orthogonal Latin squares; codes from balanced incomplete block designs