DEPARTMENT OF MATHEMATICS
FOURTH YEAR COURSES 2018/2019

Brief Descriptions

Please note that these courses run subject to demand and we might have to ask you to make an alternative selection at the start of the semester if the class is too small.

APPLIED MATHEMATICS C, F10AC1 (Fluid Mechanics)
[Semester 1, Schroers]
The goal of the course is to derive the mathematical models for fluid mechanics and use them to explain natural phenomena as well as outline important engineering applications. The course will include the continuum hypothesis, dynamics and properties of fluids, Euler and Navier-Stokes equations and vorticity with applications to Stokes flow, boundary layers, vortex sheets, compressible flows and shock waves.

MATHEMATICAL BIOLOGY A, F10AM1
[Semester 1 White,]
The course aims to teach the application of ordinary differential equations and difference equations to problems in ecology. It will provide an understanding of the mathematical modelling methods that describe population dynamics, epidemiological (infectious disease) processes and evolutionary processes in ecological systems and instruction in the biological interpretation of mathematical results.

FUNCTIONAL ANALYSIS, F10MF1
[Semester 1, Youngson]
This course introduces measure theory and functional analysis. The course includes measure and integration, monotone and dominated convergence theorems, application to evaluation of integrals, normed and inner product spaces, operators and their adjoints and inverses.

OPTIMIZATION, F10MM1
[Semester 1, Breit]
The main aim of this course is to present different methods of solving optimization problems in the three areas of linear programming, nonlinear programming, and classical calculus of variations. The course includes analytic techniques for analyzing functions, strong and classical Lagrangian classical techniques, linear programming and dynamic programming.

NUMERICAL ANALYSIS C, F10NC1
[Semester 1, Duncan]
Ordinary differential equations (ODEs) are central to mathematics and a multitude of different applications. Often solutions to ODEs can only be approximated numerically with a computer. This module provides an introduction to the derivation and analysis of techniques to do this both accurately and efficiently. The course includes approximation methods for initial value problems, single-step and multi-step methods, accuracy and stability, two-point boundary value problems, shooting techniques and finite difference methods.

PURE MATHEMATICS C, F10PC1 (Number Theory)
[Semester 1, Ciobanu]
This course gives an introduction to some advanced topics in Number Theory such as quadratic reciprocity, Gaussian integers, the distribution of primes, the Riemann zeta function, elliptic curves and Fermat's last theorem.

MATHEMATICAL BIOLOGY B, F10AN2
[Semester 2, Painter]
This course develops models of biological, medical and physiological processes including wound healing, cancer growth, heart disease, nerve impulses and disease spread. This course will teach the application of ordinary differential equations to simple biological and medical problems, the use of mathematical modelling in biochemical reactions, the application of partial differential equations in describing spatial processes such as cancer growth and pattern formation in embryonic development, and the use of delay-differential equations in physiological processes.

PARTIAL DIFFERENTIAL EQUATIONS, F10MP2
[Semester 2, Coutand]
The course aims to provide knowledge in the theory of partial differential equations. The course includes classification of linear second order equations, Cauchy problems, well posed problems for PDEs, the wave equation, the heat equation, Laplace's equation and Green's functions.

NUMERICAL ANALYSIS D, F10ND2
[Semester 2, Schmuck]
This course provides an introduction to the techniques and analysis required to find the numerical solution of partial differential equations. The course includes numerical solutions of PDE's, finite difference methods for elliptic boundary value problems, Dirichlet and Neumann boundary conditions, finite difference methods for parabolic and hyperbolic initial value problems, the heat equation and wave equations.

PURE MATHEMATICS D, F10PD2 (Hilbert Space Operators)
[Semester 2, Boulton]
In this course we examine classical results about linear operators on Hilbert spaces. We begin by studying the concepts of projection and dimension on separable Hilbert spaces. We then study the concept of compact operators which is fundamental in functional analysis. We subsequently focus on the spectral theorem for compact selfadjoint operators. Then we study the solution of Fredholm and Volterra integral equations.

GEOMETRY, F10PG2
[Semester 2, Schroers]
This course develops methods of multidimensional calculus to investigate geometrical properties of smooth curves and surfaces. The topics covered include curves in Euclidean space, vector fields and differential forms, moving frames and structure equations, surfaces in Euclidean space, curvature and geodesics.