

be able to think strategically, understand and explain a wide range of problems. Students will learn how to recognize and model strategic situations, to predict when and how your actions will influence the decisions of others and to exploit strategic situations for your own benefit. It is also important to emphasize that game theory is a deductive, mathematical enterprise; therefore, it requires abstract, symbolic reasoning. The major topics covered are strategic games, extensive games with perfect and imperfect information, and coalitional games.

MATH 3425 Graph Theory (3,3,0)

Prerequisite: MATH 1205 Discrete Mathematics
This course covers some fundamental concepts and principles of graph theory. Some algorithms of graphs are also discussed. Students will learn some techniques to solve some graph problems.

MATH 3426 Number Theory (3,3,0)

Prerequisite: MATH 1205 Discrete Mathematics
This course provides an introduction to the theory of numbers. Basic concept such as divisibility, congruence, diophantine equations will be covered. Some applications such as cryptography will be introduced.

MATH 3427 Real Analysis (3,3,0)

Prerequisite: MATH 2215 Mathematical Analysis
This course provides an introduction to measure theory, Lebesgue integration, L^p spaces, and Fourier analysis. Equipped with this knowledge, students are prepared for further studies in numerical analysis, functional analysis and advanced probability theory.

MATH 3591 Mathematical Science Project I (3,0,9)

Prerequisite: Year III standing
This is a half-year individual project which usually relates to an interdisciplinary or applied topic, and requires knowledge and skill acquired in various courses. A thesis and an oral presentation are required upon completion of the project.

MATH 3592 Mathematical Science Project II (3,0,9)

Prerequisite: MATH 3591 Mathematical Science Project I and Recommendation by the supervisor
This is an extension of MATH 3591 for outstanding students, who are now supposed to conduct more innovative further developments for their results obtained in MATH 3591. A thesis and an oral presentation for Project I are waived but will be required upon completion of Project II.

MATH 3605 Numerical Methods II (3,3,0)

Prerequisite: MATH 3206 Numerical Methods I, MATH 3405 Ordinary Differential Equations

This is the continuation of the Numerical Methods I. The course covers the concepts of Discrete/Fast Fourier Transform (DFT/FFT), the concepts of optimization, numerical methods for solution of systems of nonlinear equations, numerical methods for optimization and algorithms for solutions of initial value problems and boundary value problems for ordinary differential equation. The constructions of the algorithms and their advantages and limitations will be discussed so that the results of the computations can be properly interpreted.

MATH 3606 Partial Differential Equations (3,3,0)

Prerequisite: MATH 2205 Multivariate Calculus, MATH 3405 Ordinary Differential Equations

This course introduces the theory of multi-dimensional scalar and system of parabolic, elliptic and hyperbolic partial differential equations (PDEs) that model physical processes in areas such as physics, biology, chemistry and social science. Solution techniques such as the separation of variables, eigenfunction expansions, Green functions, Fourier and Laplace transforms for solving the equations in a bounded and unbounded domain, with homogeneous and inhomogeneous source term will be studied in detail. Some classical numerical methods such as finite difference schemes and finite elements schemes for solving partial differential equations will also be introduced.

MATH 3607 Boundary Value Problems (3,3,0)

Prerequisite: MATH 2205 Multivariate Calculus, MATH 3606 Partial Differential Equations

The principle objective of this course is to tie together the mathematics developed and the student's physical intuition by solving boundary value problems involving partial differential equation. This is accomplished by deriving the mathematical model, by using physical reasoning in the mathematical development, by interpreting mathematical results in physical terms, and by studying the heat, wave, and potential equations separately. Student is assumed to have enough background in physics to follow the derivations of the heat and wave equations.

MATH 3615 Digital Image Analysis (3,2,2)

Prerequisite: MATH 1005 Calculus
This course aims to introduce students to the foundation of digital image analysis. Students will learn elementary point operation techniques for image enhancement, and advanced techniques (including the theory of Fourier transform) for image restoration and image analysis. Students will come to understand all the major issues involved in the design and implementation of a digital imaging system.

MATH 3616 Numerical Methods for Differential Equations (3,3,0)

Prerequisite: MATH 3606 Partial Differential Equations and MATH 3206 Numerical Methods I

This course introduces the major numerical techniques for solving partial differential equations. Emphasis is placed on finite difference methods and finite element methods. Some typical engineering problems, such as shock waves, are analysed.

MATH 3617 Systems and Control Theory (3,3,0)

Prerequisite: MATH 1005 Calculus, MATH 2207 Linear Algebra

Many problems in social science, economics, and engineering, can be modeled as linear systems. This course studies the properties of linear systems and how they can be controlled. Emphasis will be placed in understanding the important issues involved in the design and implementation of linear systems, in particular the stability analysis of feedback systems. Examples will be drawn from a wide range of fields.

MATH 3620 Numerical Methods II (3,3,0) (E)

Prerequisite: MATH 2140 Numerical Methods I
As a continuation of MATH 2140 Numerical Methods I, this course covers techniques for numerical solution of mathematical problems. Students are introduced to widely-used computer software packages. At the same time the underlying ideas of algorithms are taught.

MATH 3625 Advanced Numerical Analysis (3,3,0)

Prerequisite: MATH 3206 Numerical Methods I
This course provides a theoretical understanding of the major ideas of numerical analysis. Emphasis is placed on the study of underlying principles, error bounds, convergence theorems, etc. in the area of numerical analysis.

MATH 3640 Theoretical Numerical Analysis (3,3,0) (E)

Prerequisite: MATH 2140 Numerical Methods I
This course provides a theoretical understanding of the major ideas of numerical analysis. Emphasis is placed on the study of underlying principles, error bounds, convergence theorems, etc. in the area of numerical analysis.

MATH 3650 Topology (3,3,0) (E)

Prerequisite: MATH 1111-2 Mathematical Analysis I & II
This course covers the essential concepts of topological spaces. Important topological properties are also taught to lay the ground work for further studies.