MATH 4407 Galois Theory (3,3,0)
Prerequisite: MATH 3406 Abstract Algebra
This course covers the theory of Galois. Field extension will be introduced. The solubility by radicals of a quintic equation will be covered. This course also covers the problems of duplicating the cube, trisecting the angle, and squaring the circle by ruler and compass; the construction of regular polygons; the solution of cubic and quartic equations.

MATH 4415 Group Theory (3,3,0)
Prerequisite: MATH 3406 Abstract Algebra
This course covers some advanced properties of groups. The structure of some particular finite groups will be covered. Apply the group actions on counting orbits and analysing the structure of groups.

MATH 4416 Combinatorics (3,3,0) (E)
Prerequisite: MATH 1205 Discrete Mathematics
This is an advance level enumerative combinatorics course. This course introduces a systematic coverage of enumeration of configurations with specified properties. Some combinatorics objects and some advanced techniques for counting, such as recurrence relation, generating function, Burnside's theorem, cyclic index and Pólya's theorem, will be introduced.

MATH 4417 Topology (3,3,0)
Prerequisite: MATH 2215 Mathematical Analysis
This course covers the essential concepts of topological spaces. Important topological properties are also taught to lay the ground work for further studies.

MATH 4465 Special Topics in Mathematics I (3,3,0)
MATH 4466 Special Topics in Mathematics II (3,3,0)
MATH 4467 Special Topics in Mathematics III (3,3,0)
This course is devoted to the study of up-to-dated and important topics in different areas of mathematics. Emphasis is laid on the continuation and consolidation of those fundamental courses offered in the programme. It is specifically designed with the flexibility to take advantage of visiting scholars from other institutions to introduce topics that are under current research.

MATH 4605 Computational Fluid Dynamics (3,3,0)
Prerequisite: MATH 3605 Numerical Methods II, MATH 3616 Numerical Methods for Differential Equations
The course introduces the basic theory of computational fluid dynamics. The fundamental equations for compressible viscous fluid known as the Navier-Stokes equations will be derived based on conservation laws of mass, momentum and energy. Using as a case study, the system of equations will be solved numerically for channel flow and flow over a cylinder in the general curvilinear coordinates using a standard second order finite difference scheme and/or high order spectral methods. Computational issues such as the design and implementation of numerical algorithms, grid mapping, initial conditions, inflow/outflow and wall boundary conditions, filtering, efficiency and parametric studies will be investigated and results of simulations will be analysed. If time allowed, parallel implementation of the algorithms via message passing interface (MPI) will be discussed. This course has a heavy load of computer programming and simulations.

MATH 4606 Functional Analysis (3,3,0)
Prerequisite: MATH 2207 Linear Algebra, MATH 2215 Mathematical Analysis, MATH 3427 Real Analysis or consent of instructor
This course aims at familiarizing the student with the basic concepts, principles and methods of functional analysis and its applications. Functional analysis plays an important role in the applied sciences as well as in mathematics itself. Roughly speaking, functional analysis develops the tools from calculus and linear algebra further to the more general setting where one has vector spaces comprising functions or general abstract infinite-dimensional vector spaces. Problems from various application areas can then be conveniently posed in this common general set up, and solved using the techniques of functional analysis. The basic objects studied in functional analysis are vector spaces with a notion of distance between vectors, and continuous maps between such vector spaces. This interplay between the algebraic and analytic setting gives rise to many interesting and useful results, which have a wide range of applicability to diverse mathematical problems, such as from numerical analysis, differential and integral equations, optimization and approximation theory.

MATH 4607 High-Order Methods for Hyperbolic Conservation Laws (3,3,0)
Prerequisite: MATH 3605 Numerical Methods II, MATH 3616 Numerical Methods for Differential Equations
The course will introduce high order numerical methods for solution of system of hyperbolic partial differential equations with focus on Burgers equation and Euler equations. The topics will include but not limited to pseudospectral methods and weighted essentially non-oscillatory (WENO) finite difference schemes for nonlinear hyperbolic PDEs. Both theoretical and computational aspects of the methods will be studied in the course. The high order high performance software library PseudoPack/WENOPack written in Object oriented programming language FORTRAN 95 will be used for the computational projects.

MATH 4615 Introduction to Numerical Linear Algebra (3,3,0)
Prerequisite: MATH 2207 Linear Algebra, MATH 3206 Numerical Methods I
This course aims to provide a thorough discussion of the advanced topics and state of art development in numerical linear algebra. This course emphasizes on both the theoretical analysis and the computer applications of numerical linear algebra in various areas.

MATH 4665 Special Topics in Applied Mathematics I (3,3,0)
MATH 4666 Special Topics in Applied Mathematics II (3,3,0)
MATH 4667 Special Topics in Applied Mathematics III (3,3,0)
This course is devoted to the study of up-to-date and important topics in different areas of applied mathematics. Emphasis is laid on the continuation and consolidation of those fundamental applied courses offered in the programme. It is specifically designed with the flexibility to take advantage of visiting scholars from other institutions to introduce topics that are under current research.

MATH 4675 Special Topics in Computational Mathematics I (3,3,0) (E)
MATH 4676 Special Topics in Computational Mathematics II (3,3,0)
MATH 4677 Special Topics in Computational Mathematics III (3,3,0)
This course is devoted to the study of up-to-date and important topics in different areas of computational mathematics. Emphasis is laid on the continuation and consolidation of those fundamental applied courses offered in the programme. It is specifically designed with the flexibility to take advantage of visiting scholars from other institutions to introduce topics that are under current research.

MATH 4805 Applied Nonparametric Statistics (3,3,0)
Prerequisite: MATH 2216 Statistical Methods and Theory
The course aims at introducing some efficient nonparametric statistical methods to students and let them know how to use those methods in practice. Corresponding programming techniques to facilitate these practices will also be introduced within the platforms of MATLAB. Case studies will be provided to make the students acquainted with the elementary techniques.

MATH 4806 Asymptotics in Statistics (3,3,0) (E)
Prerequisite: Year IV standing or above or cosent of instructor
To provide senior students with advanced statistics, especially some modern knowledge so that students can have a good preparation for research.