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 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)
Prerequisite: Year IV standing or above or Consent of instructor
To provide senior students with advanced statistics, especially some modern knowledge so that students can have a good preparation for research.

MATH 4807 Categorical Data Analysis (3,3,0)
Prerequisite: MATH 3805 Regression Analysis
To equip students with statistical methods for analyzing categorical data arisen from qualitative response variables which cannot be handled by methods dealing with quantitative response, such as regression and ANOVA. Some computing software, such as SAS, S-PLUS, R or MATLAB, will be used to implement the methods.

MATH 4815 Interior Point Methods for Optimization (3,3,0)
Prerequisite: MATH 3205 Linear and Integer Programming
This course aims to introduce students to the fundamental topics in the interior point based methods for optimization, both the discrete and continuous versions of the interior point methods will be taught. Students will learn theory, techniques and solution schemes of the interior point based methods for linear programming, quadratic programming, convex programming, and semi-definite programming problems. Some Mathlab implementation will be also addressed.

MATH 4816 Optimization Theory and Techniques (3,3,0)
Prerequisite: MATH 2207 Linear Algebra, MATH 2215 Mathematical Analysis
This course aims to (a) provide the fundamental theory and techniques in unconstrained and constrained optimization, (b) introduce some existing numerical software packages, and (c) offer some interdisciplinary techniques and applications related to optimization.

MATH 4817 Stochastic Processes (3,3,0)
Prerequisite: MATH 2216 Statistical Methods and Theory
To introduce the theory of stochastic processes with their application, and to develop and analyse probability models that capture the salient features of the system under study to predict the short and long term effects that this randomness will have on the systems under consideration.

MATH 4825 Survival Analysis (3,3,0)
Prerequisite: MATH 3805 Regression Analysis, MATH 4807 Categorical Data Analysis
This course aims to provide students with a good understanding of techniques for the analysis of survival data, including methods for estimating survival probabilities, comparing survival probabilities across two or more groups, and assessing the effect of covariates on survival. The emphasis will be on practical skills for data analysis using statistical software packages. Students will form groups to do projects involving the analysis of real data.

MATH 4826 Time Series and Forecasting (3,3,0)
Prerequisite: MATH 3805 Regression Analysis
The course aims at providing students with an understanding of the statistical methods for time series data whose order of observation is crucially important in depicting the background dynamics of the related social, economical, and/or scientific phenomena. The students will learn to use various time series models and techniques such as exponential smoothing, ARIMA, etc., to model and make forecasts. 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 4998 Mathematical Science Project I (3,0,9)
Prerequisite: Year IV 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 4999 Mathematical Science Project II (3,0,9)
Prerequisite: MATH 4998 Mathematical Science Project I, and Recommendation by the supervisor
This is an extension of MATH 4408 for outstanding students, who are now supposed to conduct more innovative further developments for their results obtained in MATH 4408. A thesis and an oral presentation for Project I are waived but will be required upon completion of Project II.

MATH 7010 Topics in Graph Theory (3,3,0)
Prerequisite: Postgraduate standing or consent of instructor
This course provides fundamental concepts and principles of graph theory to students who might be interested to pursue research in that field, or to graduate students who wants exposure to graph theory. It will give a survey on recent results and possible research directions. While graduate standing in Mathematics or related area may find this subject useful.

MATH 7020 Finite Element Methods (3,3,0)
Prerequisite: Postgraduate standing or consent of instructor
To introduce the concepts of finite element methods, typical elements in engineering applications, demonstrate the use of software packages, and to introduce the convergence theory of the finite element method.

MATH 7030 Numerical Linear Algebra (3,3,0)
Prerequisite: Postgraduate standing or consent of instructor
This course covers the advanced topics in numerical linear algebra. Theoretical issues as well as practical computer applications will be addressed.

MATH 7050 Optimization Theory and Techniques (3,3,0)
Prerequisite: Postgraduate standing or consent of instructor
This course introduces the fundamental theory and techniques for both unconstrained and constrained optimization. Overview of the existing numerical software packages will be addressed. Finally some interdisciplinary techniques and applications related to optimization will be discussed.