MATH 3835 Quality Control and Management (3,3,0)
Prerequisite: MATH 2206 Probability and Statistics
This course aims to equip students with a variety of modern statistical methods, such as control charts, acceptance sampling plans and capability analysis, for continuing quality and productivity improvement in the manufacturing industry and service industry. Students will develop the skills necessary to decide whether or not bulk delivered services and products are of acceptable quality, to investigate the suitability of a process for performance of a given task, and to identify opportunities for immediate performance improvement. Contemporary quality management systems such as total quality control and six-sigma will be introduced.

MATH 3840 Numerical Analysis of Delay Differential and Volterra Function Equations (3,3,0)
Prerequisite: MATH 1120 Linear Algebra and MATH 2140 Numerical Methods I or consent of the instructor
This course will provide a thorough introduction to the numerical analysis and the computational solution of functional differential and integral equations with delay (or retarded) arrangements. Starting with a brief review of the basic theory of delay differential and more general Volterra functional equations, it will lead the students to the current "state of the art" in this very active area of numerical analysis.

MATH 3850 Optimization Theory and Techniques (3,3,0) (E)
Prerequisite: Year II or Year III standing, or consent of the instructor
This course aims to provide the fundamental theory and techniques in unconstrained and constrained optimization, to introduce some existing numerical software packages, and to offer some interdisciplinary techniques and applications related to optimization.

MATH 3980 Special Topics in Mathematics (3,3,0) (E)
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 3990 Advanced Topics in Mathematics (3,3,0) (E)
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 4405 Coding Theory and Cryptography (3,3,0)
Prerequisites: MATH 3406 Abstract Algebra and MATH 3426 Number Theory
This course will introduce the exciting fields of coding theory and cryptography to students. Students will study the mathematics behind encrypting and decrypting secret messages as mathematics has played an important role in developing and breaking codes. Furthermore, we will introduce coding schemes for detecting and correcting errors that occur during the data transmission. To study these symbiotic disciplines, you need to make use of the knowledge of basic linear algebra, abstract algebra, number theory, probability, and combinatorics. You will also develop skills in problem solving and logical reasoning.

MATH 4406 Differential Geometry (3,3,0)
Prerequisite: MATH 2205 Multivariate Calculus and MATH 3405 Ordinary Differential Equations
This course teaches students the mathematical tools of classical differential geometry. Applications to curve and surface designs are also given.

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)
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 4465-7 Special Topics in Mathematics I-III

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.