major health problems that have had the greatest impact on our community and their causes, and the place of science and technology in dealing with related problems. The emphasis will be put on how scientific reasoning has been used to solve health problems. In this course, the roles of the individual and society in maintaining good public health and handling possible public health crises will also be explored. We will discuss, in particular, the responsibilities of individuals, health care professionals and government in maintaining and promoting public health. In this connection, individuals' rights in general and patients' rights in particular will be discussed, and moral issues arising from the allocation of public resources and using biotechnology in public health care will be examined.

LSE 7080 Science, Technology and Environmental Ethics (3,3,0)

This course deals with the ethical dilemma of modern application of science and technology in our pursuit of a better world. Science and technology have greatly enhanced the quality of our lives and our productivity. Yet, they do so at the expense of the environment and other life forms including our future generations. The ethical problem of the effects of science and technology on the environment will be tackled critically from historical, ethical, religious, and individual perspectives. This course mainly deals with the issues intended to match the requirements of the curriculum structure for liberal studies in secondary schools.

LSE 7090 Religion and Liberal Studies (3,3,0)

The study of religion is highly relevant to liberal studies. This course introduces to students the multifaceted relationship between religion and other components of culture, society, and the various dimensions of the human self. Different approaches to the study of religion will also be introduced.

LSE 7100 Cross-modular Topics in Liberal Studies (3,3,0)

Several issues which encompass multiple dimensions of themes pertinent to liberal studies will be explored, so that students' understanding of the interconnectedness of these areas of study and means of teaching them to senior secondary school students will be enhanced. Issues studied here will engage explorations into different perspectives of liberal studies and the insights gained by understanding their interrelationships. These perspectives will have three main areas of study—self and personal development; society and culture; science, technology and the environment—as well as any one or several of the issues involved in independent inquiry (e.g. media, education, religion, sports, arts, information and communication technology).

LSE 7111-2 Dissertation (3,*,*)

This is an optional class for competent students who have determined an appropriate topic through consultation with their chosen faculty adviser. Students will pursue in-depth research on a specific topic in Liberal Studies. Pertinent themes include those related to any of the three main areas of study—self and personal development; society and culture; science, technology and the environment—as well as topics itemized as relevant areas for independent inquiry which also engage more or less with the above three main areas of studies (e.g. media, education, religion, sports, arts, information and communication technology). The length of the dissertation should be either about 15,000 Chinese characters or about 12,000 English words (not including bibliography and footnotes).

MATH 1000 Supplementary Mathematics (Calculus and Linear Algebra) (0,3,0) (E)

This course deals with the basic linear algebra, elementary functions and elementary calculus. It provides a good foundation for the students who have not taken AL Pure Mathematics.

MATH 1005 Calculus (3,3,0) (E)

Prerequisite: HKDSE Mathematics-Compulsory Part

This course is intended to introduce general calculus of a single real variable. It will help students to understand the basic concepts and fundamental theories of differentiation, integration and their applications.

MATH 1111 Mathematical Analysis I (3,3,1) (E)

Prerequisite: Year I standing

This course deals with the basic theory of analysis in real-valued functions in single variable. It provides students with a good foundation for more advanced courses in the mathematical science major. Topics include real numbers, sequences and series, limit and continuity, differentiation and indefinite integral.

MATH 1112 Mathematical Analysis II (3,3,1) (E)

Prerequisite: MATH 1111 Mathematical Analysis I

This course deals with the basic theory of analysis in real-valued functions in single variable. It provides students with a good foundation for more advanced courses in the mathematical science major. Topics include sequences and series, Riemann integrals and power series.

MATH 1120 Linear Algebra (3,3,1) (E)

Prerequisite: Year I standing

Linear equations, matrices, determinants. Introduction to vector spaces and linear transformations and bases. Inner products and orthogonality. Eigenvalues and eigenvectors; diagonalization. Least squares problems. Applications. The course emphasizes matrix and vector calculations and applications. Numerical experiments with Matlab© in advanced lecture.

MATH 1130 Discrete Structures (3,2,1) (E)

This course addresses a variety of fundamental topics in computer science, including propositional logic, proof technique, set theory, combinatorics, graph theory, and Boolean algebra.

MATH 1140 Computational Mathematics (3,3,0) (E)

Prerequisite: MATH 1000 Supplementary Mathematics (Calculus and Linear Algebra) or Grade D or above in AL Pure Mathematics

This course aims to introduce Computer Science major students to the basic concepts in modern computational mathematics and its application. It provides various solid fundamental concepts and knowledge for modelling, real life application and optimization. Topics include advanced vector Algebra, number system, linear systems, various numerical methods, power method, numerical optimization and multivariable calculus. Practical applications and programming techniques are both emphasized.

MATH 1205 Discrete Mathematics (3,3,0) (E)

Prerequisite: HKDSE Mathematics-Compulsory Part

This course integrates the fundamental topics in discrete mathematics and linear system. These topics, including propositional logic, proof methods, set theory, combinatorics, graph algorithms, Boolean algebra, and system of linear equations, are essential for precise processing of information.

MATH 1550 Calculus and Linear Algebra (3,3,0) (E)

This course introduces topics in linear algebra, mathematical analysis and differential equations. Applications to chemistry are provided.

MATH 1570 Advanced Calculus (3,3,0) (E)

Prerequisite: Year I standing

This course gives students fundamental mathematical knowledge in a wide variety of areas including vector algebra, vector differentiation and integration, as well as an introduction to baisc linear algebra.

MATH 1590 Calculus and Linear Algebra for Chemistry (3,3,0) (E)

This course introduces topics in linear algebra, mathematical analysis and differential equations. Applications to chemistry are provided.

MATH 2005 Probability and Statistics for Computer Science (3,3,1) (E)

Prerequisite: MATH 1005 Calculus; students with credit for MATH 2206 are not allowed to take MATH 2005 for further credit

This course aims to provide an understanding of the basic concepts in probability and statistical analysis, and focuses on applied probability and statistics. Students will learn the fundamental concepts of random variables, the basic concepts and techniques of parameter estimation and hypothesis testing. After taking this course, students will be able to apply the concepts to real-life IT/engineering applications and use popular statistics packages, such as SAS, SPSS, S-Plus, R or MATLAB, to perform simple and sophisticated analysis.

MATH 2006 Probability and Statistics for Science (3,3,0) (E)

Prerequisite: MATH 1005 Calculus; students with credit for MATH 2005 or MATH 2206 are not allowed to take MATH 2006 for further credit

This course aims to provide an understanding of the basic concepts in probability and statistical analysis, and focuses on applied probability and statistics. Students will learn the fundamental concepts of random variables, the basic concepts and techniques of parameter estimation and hypothesis testing. After taking this course, students will be able to apply the concepts and methods to solve different problems in Science and use popular statistics packages, such as R, to perform analysis.

MATH 2110 Differential Equations (3,3,0) (E)

Prerequisite: MATH 1111 Mathematical Analysis I, MATH 1112 Mathematical Analysis II and MATH 1120 Linear Algebra

This course aims to introduce students to the basic theory of ordinary differential equations and the modelling of diverse practical phenomena by ordinary differential equations by a variety of examples. Students will learn both quantitative and qualitative methods for solving these equations. Topics include first and second order differential equations, linear systems of first order differential equations, autonomous systems of differential equations, existence and uniqueness theorem and Laplace transform to initial value problem.

MATH 2130 Real Analysis (3,3,0) (E)

Prerequisite: MATH 1111 Mathematical Analysis I

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 2140 Numerical Methods I (3,3,0) (E)

Prerequisite: Year II standing

This course provides students with the ideas underlying commonly used numerical methods. It teaches students how to choose an appropriate numerical method for a particular problem and to interpret the resulting output. It also highlights important considerations on convergence and stability for numerical algorithm design.

MATH 2150 Mathematical Analysis III (3,3,0) (E)

Prerequisite: MATH 1111-2 Mathematical Analysis I & II (MATH 1120 Linear Algebra is not required but recommended)

This course deals with vectors calculus. It provides basic concept on several variables real-valued functions. Topics include sequences in space, limit and continuity, differentiation, Riemann integrals, multiple integrals, line integrals and surface integrals.

MATH 2160 Mathematical and Statistical Software (3,1,2)

Prerequisite: COMP 1170 Structured Programming

This course teaches students how to use some popular software packages for solving problems in various areas of mathematics, statistics and operations research. Examples of software packages that may be covered are MATLAB, SAS, S-plus, LINDO, and Latex. Students will learn both how to use these software packages to efficiently to solve the related problems and how to interpret the results. Such knowledge should be useful for students' course work, projects and future careers.

MATH 2205 Multivariate Calculus (3,3,1) (E)

Prerequisite: MATH 1005 Calculus, MATH 2207 Linear Algebra or MATH 1205 Discrete Mathematics (*recommended*)

This course deals with calculus and functions of several variables. Students should know the basic concepts and technique of univariate calculus. Some knowledge on linear algebra, such as matrix notations and calculations, is preferred. Topics include partial derivative, multiple integral, and their theories and applications.

MATH 2206 Probability and Statistics (3,3,1) (E)

Prerequisite: HKDSE Mathematics-Compulsory Part

This course deals with probability and statistical methods. The emphasis is on what, how, when and why certain probability model and statistical methods can and cannot be applied. Topics include exploratory data analysis, distributions of random variable, estimation, hypothesis testing, analysis of variance, simple linear regression and nonparametric methods. Students are required to solve a variety of problems by using calculators and statistical tables.

MATH 2207 Linear Algebra (3,3,1) (E)

Prerequisite: HKDSE Mathematics-Compulsory Part

Introduction to linear equations, matrices, determinants, vector spaces and linear transformations, bases, inner products, orthogonality, eigenvalues and eigenvectors, diagonalization, least squares problems and other applications. The course emphasizes matrix and vector calculations and applications.

MATH 2215 Mathematical Analysis (3,3,1) (E)

Prerequisite: MATH 1005 Calculus or MATH 1205 Discrete Mathematics (*recommended*)

This course places its main weight on mathematical analysis with using ε–δ argument s an introduction to proofs. It pays special attention to developing the students' ability to read and write proofs. Covered materials include sets and functions, real numbers, open and closed sets, limits of sequences and series, limits and continuity of functions, infinite series, and sequences.

MATH 2216 Statistical Methods and Theory (3,3,1) (E)

Prerequisite: MATH 1005 Calculus or HKDSE Mathematics with Module 1/2, MATH 2207 Linear Algebra or MATH 2205 Multivariate Calculus (*recommended*)

This course deals with the elementary probability theory and the mathematical foundation of some commonly used statistical methods. First the rigorous mathematical frame of the probability theory based upon the concepts of random variables and probability distributions are introduced. The general procedures of statistical inference, such as parameter estimation, hypothesis test, analysis of variance are demonstrated with detailed discussion about their mathematical features. Students are required to comprehend the most commonly used probability distributions and their relations. Central Limit Theorem and related statistical application should be well understood. Several optimal schemes for the estimation accuracy and the hypothesis test power form another important part of the course.

MATH 2220 Partial Differential Equations (3,3,0) (E)

Prerequisite: MATH 1111 Mathematical Analysis I and MATH 2110 Differential Equations

This course treats the theory and solution techniques for partial differential equations appearing in physics, biology, chemistry and social sciences.

MATH 2230 Operations Research I (3,3,0) (E)
Prerequisite: MATH 1120 Linear Algebra
This course aims to introduce students some fundamental topics in operations research. Students will learn theory, techniques and applications of linear programming, network programmes, dynamic programming and inventory control problems.

MATH 2610 Graph Theory (3,3,0) (E)
Prerequisite: Year II standing
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 2630 Number Theory (3,3,0) (E)
Prerequisite: Year II standing
This course will provide 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 2770 Internship I (1,0,0)
Prerequisite: Students must apply to and receive permission from the co-op coordinator preferably one semester in advance
This is a work experience programme available to students in MATH. Interested students should contact departmental advisors as early in their careers as possible, for proper counselling.

MATH 2780 Internship II (1,0,0)
Prerequisite: MATH 2770 Internship I, and students must apply to and receive permission from the co-op coordinator preferably one semester in advance
This is a work experience programme available to students in MATH. Interested students should contact departmental advisors as early in thier careers as possible, for proper counselling.

MATH 3205 Linear and Integer Programming (3,3,0)
Prerequisite: MATH 2207 Linear Algebra
This course aims to introduce students to the fundamental topics in Linear and Integer programming. Students will learn theory, techniques and applications of linear programming and integer programming. Some modeling techniques will be also introduced for linear and integer programming. However, the interior point theory will not be covered.

MATH 3206 Numerical Methods I (3,3,0)
Prerequisite: MATH 1005 Calculus and MATH 2207 Linear Algebra
This introductory course presents students some classical and commonly used numerical methods in various disciplines involving computing and numerical approximation and solution of equations. The course teaches students how to choose an appropriate numerical method for a particular problem and to understand the advantages and limitations of the chosen numerical scheme for a given mathematical problem so that results from the computation can be properly interpreted. The course also highlights important theoretical considerations on convergence and stability for numerical algorithm design.

MATH 3215 Advanced Calculus I (3,3,0) (E)
Prerequisite: MATH 1005 Calculus or MATH 1205 Discrete Mathematics (*recommended*)
This course deals with the basic theory of analysis in real-valued functions in single variable. It provides students with a good foundation for more advanced courses in the mathematical science major. Topics include real numbers, sequences, limit and continuity, and differentiation.

MATH 3216 Advanced Calculus II (3,3,0) (E)
Prerequisite: MATH 3215 Advanced Calculus I
This course deals with the basic theory of analysis in real-valued functions in single variable. It provides students with a good foundation for more advanced courses in the mathematical science major. Topics include integration and series.

MATH 3285 Job Practicum I (1,0,0)
Prerequisite: Year 2 or above and students must apply to and receive permission from the co-op coordinator preferably one semester in advance
This is the first time of work experience available to students in the department of Mathematics. Interested students should contact departmental advisors as early in their careers as possible, for proper counseling.

MATH 3286 Job Practicum II (1,0,0)
Prerequisite: MATH 3285 Job Practicum I and students must apply to and receive permission from the co-op coordinator preferably one semester in advance
This is the second time of work experience available to students in the department of Mathematics.

MATH 3287 Job Practicum III (1,0,0)
Prerequisite: MATH 3286 Job Practicum II and students must apply to and receive permission from the co-op coordinator preferably one semester in advance
This is the third time of work experience available to students in the department of Mathematics.

MATH 3405 Ordinary Differential Equations (3,3,0)
Prerequisite: MATH 2215 Mathematical Analysis, MATH 2207 Linear Algebra
This course aims to introduce students to the basic theory of linear ordinary differential equations (ODE) with constant and variable coefficients and the modeling of diverse practical phenomena by ODE. Students will learn both quantitative and qualitative methods for solving these equations. Topics include first and second order scalar ODE, systems of first order ODE, autonomous systems of ODE, existence and uniqueness theorem, Laplac transform for initial value problems, regular and singular Sturm-Liouville boundary value problems and nonlinear differential equations.

MATH 3406 Abstract Algebra (3,3,0)
Prerequisite: MATH 1205 Discrete Mathematics
This course covers some properties of groups, rings and fields. Permutation groups and polynomial rings are included. Application of permutation group on counting and application of finite field on error correcting code are included.

MATH 3407 Advanced Linear Algebra (3,3,0)
Prerequisite: MATH 2207 Linear Algebra
This course is designed for mathematical science major students. General vector space, linear transformations, inner products, diagonal form, Jordan form, dual space and quadratic forms will be introduced. The course emphasizes on general theory of linear algebra.

MATH 3415 Vector Calculus (3,3,0)
Prerequisite: MATH 2205 Multivariate Calculus and MATH 2207 Linear Algebra
This course is designed to develop the intuitive understanding, theory, and computational skills necessary for the concepts of vector functions by tying together multivariate calculus with concepts of vector. Topics covered include Vector Fields, Stokes theorem, Green's theorem, Gauss' theorem, and their applications.

MATH 3416 Complex Analysis (3,3,0)
Prerequisite: MATH 2215 Mathematical Analysis
This course provides an up-to-date introduction to the basic theory of analytic functions of one complex variable. Residue Theorem and its applications to the evaluation of integrals and sums will be one of the main objectives. Also conformal mappings and their applications will be discussed.

MATH 3417 Game Theory (3,3,0)
Prerequisite: MATH 1205 Discrete Mathematics
The purpose of this class is to provide an introduction to game modeling and theory. In studying of strategic behavior among parties having apposed, mixed or similar interests, students will

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 emphases 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.

MATH 3660 Operations Research II (3,3,0) (E)
Prerequisite: MATH 1120 Linear Algebra
This course aims to introduce students to some fundamental and advanced topics in operations research. Students will learn theory, techniques, and applications of integer programming, queuing theory, Markov decision process, and nonlinear programming.

MATH 3670 Differential Geometry (3,3,0)
Prerequisite: MATH 1120 Linear Algebra and MATH 2110 Differential Equations
This course teaches students the mathematical tools of classical differential geometry. Applications to curve and surface designs are also given.

MATH 3680 Applied Functional Analysis (3,3,0) (E)
Prerequisite: MATH 1111-2 Mathematical Analysis I & II, MATH 1120 Linear Algebra, and MATH 2130 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 3720 Complex Analysis (3,3,0)
Prerequisite: MATH 1111-2 Mathematical Analysis I & II
This course provides an up-to-date introduction to the basic theory of analytic functions of one complex variable. Residue Theorem and its applications to the evaluation of integrals and sums will be one of the main objectives. Also conformal mappings and their applications will be discussed.

MATH 3760 Abstract Algebra (3,3,0) (E)
Prerequisite: MATH 1120 Linear Algebra
This course covers some properties of groups, rings and fields. Permutations groups and polynomial rings are included. Application of permutation group on counting and application of finite field on error correcting code are included.

MATH 3805 Regression Analysis (3,3,0)
Prerequisite: MATH 2206 Probability and Statistics, MATH 2207 Linear Algebra, or equivalent
This course aims to provide an understanding of the classical and modern regression analysis and techniques which are widely adopted in various areas such as business, finance, biology, and medicine. There have been great developments in the past decades such as nonlinear regression, robust regression, nonparametric and regression. With the help of a statistical package such as SAS, Matlab or R, students can analyse multivariate data by modern regression techniques without any difficulty.

MATH 3806 Multivariate Analysis and Data Mining Applications (3,3,0)
Prerequisite: MATH 2206 Probability and Statistics or equivalent, MATH 2207 Linear Algebra
To provide an understanding of the classical multivariate analysis and modern techniques in data mining. Very often, observations in the social, life and natural sciences are multidimensional or very high dimensional. This kind of data sets can be analysed by techniques in multivariate analysis and/or data mining. With the help of statistical package, such as Matlab, students will learn how to treat real multivariate problems.

MATH 3807 Simulation (3,2,1)
This course aims to introduce basic technique in computer simulation. Two computer software packages (one for continuous systems and one for discrete systems) will be taught. Various practical problems will be modeled, discussed, and simulated through computer simulation. Upon completion of this course, students should be able to simulate a wide range of practical problems in the daily life.

MATH 3815 Design and Analysis of Experiments (3,3,0)
Prerequisite: MATH 3805 Regression Analysis
To provide an understanding of various kinds of experimental designs involving factorial and uniform designs as well as design for computer experiments. The experimental design has a long history and has been widely used in industry, agriculture, quality control, natural sciences and computer experiments. They can be applied to survey design as well. Therefore, they are useful in business and social sciences. The statistical package, SAS and UD4.0 will be used to support the lecture.

MATH 3816 Design and Analysis of Surveys (3,3,0)
Prerequisite: MATH 2206 Probability and Statistics or equivalent
To provide students with a good understanding of survey operations, survey sampling methods and the corresponding analyses of data. Important points in questionnaire design will also be addressed in the course. Students will form teams to do course projects. On completion of the course, students should be able to design, carryout, and write reports based on a professional survey.

MATH 3817 Dynamic Programming and Inventory Models (3,3,0)
Prerequisite: MATH 2207 Linear Algebra, MATH 2206 Probability and Statistics, MATH 3205 Linear and Integer Programming
This course introduces basic principles, classical models, popular algorithms and various applications in other fields of inventory management and dynamic programming.

MATH 3825 Life Insurance and Life Contingencies (3,3,0)
Prerequisite: MATH 2206 Probability and Statistics or equivalent
To introduce the theory of life insurance and life contingencies with application to insurance problems. Students will learn some of the major issue in the field of actuaries.

MATH 3826 Markov Chain and Queuing Theory (3,3,0)
Prerequisite: MATH 2207 Linear Algebra, MATH 2206 Probability and Statistics, MATH 3205 Linear and Integer Programming
This course introduces basic principles, classical models, popular algorithms and various applications in other fields of Queuing Theory and Markov Chain.

MATH 3827 Network Models (3,3,0)
Prerequisite: MATH 2207 Linear Algebra, MATH 3205 Linear and Integer Programming
This course aims to introduce basic principles, classical models, popular algorithms and various applications in other fields of network programming.

MATH 3830 Numerical Linear Algebra (3,3,0) (E)
Prerequisite: MATH 1120 Linear Algebra, MATH 2140 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 subject emphasizes on both the theoretical analysis and the computer applications of numerical linear algebra in various areas.

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.

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.

MATH 7060 Complexity of Numerical Problems (3,3,0)
Prerequisite: Postgraduate standing or consent of instructor
This course is concerned with a branch of complexity theory, the information based complexity theory. It studies the intrinsic complexity of numerical problems, that means, the minimum effort required for the approximate solution of a given problem up to a given error. Based on a precise theoretical foundation, lower bounds are established, i.e. bounds which hold for all algorithms. We also study the optimality of known algorithms, and describe ways to develop new algorithms if the known ones are not optimal.

MATH 7070 Pseudospectral Methods and Radial Basis Functions (3,3,0)
Prerequisite: Postgraduate standing or consent of instructor
Spectral methods and radial basis function methods are two modern numerical techniques which have been studied extensively by scientists and engineers in the past two decades. There exist many differences between the modern numerical methods and the classical approaches such as finite element and finite difference methods. This course will provide students with a sound understanding of the highly accurate and efficient numerical schemes and a useful training on how to implement these methods.

MATH 7080 Probability and Stochastic Processes (3,3,0)
Prerequisite: Postgraduate standing or consent of instructor
This course provides the elements of the modern theory of stochastic processes. Stochastic processes and probability theory in its modern form have found wide application in the natural sciences, engineering and the finance sector. Emphasis is placed on probabilistic thinking, and applications will demonstrate the introduced concepts throughout.

MATH 7090 Advanced Numerical Methods and Algorithms (3,3,0)
Prerequisite: Postgraduate standing or consent of instructor
This course will mainly study several modern numerical methods developed in the last one or two decades. These methods will be applied to simple model problems as well as some problems with strong physical applications, such as nonlinear conservation laws and the Navier-Stokes equations. This course will provide students with a sound understanding of the highly accurate and efficient numerical schemes and a useful training on how to implement these methods.

MATH 7110 Numerical Analysis of Delay Differential and Volterra Functional Equations (3,3,0)
Prerequisite: Postgraduate standing or consent of instructor
Collocation and Galerkin methods in piecewise polynomial spaces play a fundamental role in modern numerical analysis. This course introduces the students to the application of these methods to standard integral (and integro-differential) equations of Volterra and Fredholm type, and to analogous problems with singular kernels (including boundary integral equations). While the focus of the course is on the analysis of the convergence and stability properties of these projection methods, various aspects of the practical implementation of the methods are also studied in detail.

MATH 7120 Special Topics in Mathematics (3,3,0)
Prerequisite: Postgraduate standing or consent of instructor
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 7130 Advanced Topics in Mathematics (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 7620 Business Intelligence and Decision Support (2,2,0)
The aims of this course are to study the concepts and tools of business intelligence, to explore the process, contents and context of managerial decision making and to look at how business intelligence can enhance a company's competitive advantage and improve its top management decision-support effectiveness.

MCM 7010 中醫各家學說與臨床應用 (4,4,0)
Clinical Applications of the Different Theories of Chinese Medicine
本科目旨在通過學習、理解、掌握歷代著名醫家的學術思想與臨床經驗，完善學員的知識結構，提高學員綜合運用中醫基礎知識的能力；使學員更多地學會運用變法治病，靈活應用中醫中藥，以解決實際問題；學習與借鑑諸多名醫的成功經驗，能縮短個人在臨床上的摸索時間，起到事半功倍的效果。
The course will allow students to study and master the thoughts and experiences of distinguished physicians in different dynasties with a view to improving students' knowledge structure and enhancing their ability in comprehensive application of fundamental Chinese medicine knowledge. Students will also be able to cure diseases by various methods and to handle practical cases by applying Chinese medicine according to different situations. Students may also learn from the experience of the famous physicians in order to save time from exploring in clinical practice in order to achieve twice the result with making only half the effort.

MCM 7030 中醫學思維與方法論 (3,3,0)
Thinking Approach and Methodology of Chinese Medicine
本科目旨在使學員有系統地學習中醫學的思維方法，並強化學員運用中醫學的思維方法解決臨床實際的能力。
This course will allow students to learn the thinking approach and methodology of Chinese medicine in a systematical way, and hence enhances their ability in handling practical cases by applying thinking approach and methodology of Chinese medicine.

MCM 7040 中醫藥科研方法與實踐 (3,3,0)
Research Methodology and Practices in Chinese Medicine
通過該科目的學習，使學員掌握中醫藥科學研究的基本程式和方法，為開展中醫藥科研工作奠定基礎。
This course will allow students to learn master the basic programmes and methods of scientific research in Chinese medicine in order to lay a foundation for scientific research work in Chinese medicine.

MCM 7060 方劑配伍理論與實踐 (3,3,0)
Formulation Theories and Practices of Chinese Medicinal Formulae
本科目旨在通過對各類方劑配伍規律的分析和歸納，並配合臨床實踐例證的分析，使學員充分掌握方劑配伍的理論，提高學員臨床據證析理、據理立法、依法立方的能力。
This course will allow students to learn through induction and analysis of the pattern of the various formulation theories, and incorporated with cases study and analysis in clinical practice, students will be able to have a thorough mastery of the formulation theories. Their ability to analyse clinical symptoms, establish judgment according to the symptoms, and compose formulation according to the judgment will be strengthened.