

MASTER OF SCIENCE IN APPLIED SCIENCE

Applied Science (APSC)

APSC 6600 Graduate Seminar

6 credit hours

Students develop and strengthen skills in all scientific disciplines that will benefit them throughout their careers: oral communication and public speaking, written communication and scientific writing, project planning, time and project management, networking, conflict resolution, and stress and mental health. Students are exposed to and engage with these topics through a variety of means, including lectures, seminars, readings, discussions, written assignments, oral and poster presentations, and written and oral critiques.

APSC 6603 Thesis I

6 credit hours

Thesis I constitutes the first segment of the student's thesis research project. Students normally register for this course in their first year in the program. Research is conducted under the guidance of the research thesis Supervisor in conjunction with the other Supervisory Committee members. Successful completion of APSC 6603 includes a satisfactory evaluation and Annual Assessment of the student's written and oral presentation of his/her Research Progress Report by the Supervisory Committee. The Supervisor normally submits the completed evaluation to the Program Committee on or before September 30th of that year.

APSC 6604 Thesis II

6 credit hours

Prerequisite: APSC 6603

Thesis II constitutes the second segment of the student's thesis research project. Students normally register for this course in the Fall semester of their second year in the Program. Research is conducted under the guidance of the faculty Research Supervisor in conjunction with the Supervisory Committee.

APSC 6608 Applied Statistics

3 credit hours

Students analyze scientific data at the advanced level. Topics include multivariate analysis, nonparametric methods, and model selection. During course a project component, students apply the statistical tools learned to a real dataset, ideally from their own thesis research.

APSC 6876 - 6899 Directed Studies

3 credit hours

These courses are taken during the first or second year of enrolment in the Master of Science in Applied Science program. The directed studies will be conducted under the supervision of a faculty member following approval by the Program Coordinator.

APSC 7600 Graduate Seminar

6 credit hours

The instructional part of this course focuses on research project definitions, project planning and scientific writing. Students are expected to read articles chosen for discussion, contribute to the critiquing process and make several presentations during the course. Students are expected to attend and report on a designated number of seminars or colloquia either at Saint Mary's University or at other surrounding research institutions.

All of the following courses require permission of the instructor to register.

Biology (BIOL)

BIOL 6606 Current Topics in Biology

3 credit hours

A journal article-based examination of developments in biology that are relevant to all biology graduate students. NOTE: This course is compulsory for all graduate students in biology and is normally taken in the first year.

BIOL 6607 Advanced Molecular Biology

3 credit hours

The application of molecular techniques to broad biological problems is the focus of this course. It is suitable not only for students pursuing a degree in molecular biology but also to those who will use advanced techniques such as DNA sequencing, bioinformatics and genomics to approach larger aspects of biology, for example population genetics, taxonomic problems, paternity identification, etc.

BIOL 6608 Biostatistics for Graduate Students

3 credit hours

Analysis of biological data at the advanced level. The course will build on previous biostatistics experience and include multivariate analysis, nonparametric methods, and model selection as well as manipulation and analysis of large, complex databases.

BIOL 6609 Field Methods and Experimental Design

3 credit hours

Students will be exposed to standard methodologies for data collection under field conditions, including sampling protocols, technical devices available and types of numerical and descriptive data that are typically collected. Design of both experimental and ecological research projects will be discussed.

BIOL 6625 Theoretical Plant Ecology

3 credit hours

This course offers an advanced treatment of plant ecology, starting with theoretical principles but moving into empirical tests of theory. Topics covered include competition, facilitation, coexistence, ecosystem functioning, plant traits and modeling. Students will collaborate on a common experiment or field study during the course.

BIOL 6690 - 6699 Directed Study in Biology

3 credit hours

These courses are intended to supplement the course offerings in biology and allow students to delve deeper into a subject of particular interest to them. Students must show some initiative and be willing to work independently.

Chemistry (CHEM)

CHEM 6611 Selected Topics in Physical Chemistry

6 credit hours

This is a graduate-level directed study course in a specific area of physical chemistry. Topics can vary but reflect the expertise of the instructor and the research interests of the student(s).

CHEM 6612 Quantum Chemistry

3 credit hours

The advanced principles of quantum physics are used to develop an understanding of atomic and molecular structure. This is a modified version of undergraduate course CHEM 4412. Students attend the undergraduate lectures and are expected to complete at least the course requirements of the undergraduate course as well as any supplementary graduate requirements as specified by the instructor.

CHEM 6613 Physical Chemistry

3 credit hours

An advanced course on statistical thermodynamics and the study of chemical reaction rates and mechanisms. This is a modified version of undergraduate course CHEM 4413. Students attend the undergraduate lectures and are expected to complete at least the course requirements of the undergraduate course as well as any supplementary graduate requirements as specified by the instructor.

CHEM 6614 Symmetry and Chemical Applications of Group Theory

3 credit hours

An advanced course on symmetry and group theory for the experimental chemist. Applications of point groups and space groups in organic chemistry, inorganic chemistry, molecular spectroscopy, atomic and molecular structure and crystallography. This is a modified version of undergraduate course CHEM 4414. Students attend the undergraduate lectures and are expected to complete at least the course requirements of the undergraduate course as well as any supplementary graduate requirements as specified by the instructor.

CHEM 6621 Selected Topics in Inorganic Chemistry

6 credit hours

This is a graduate-level directed study course in a specific area of inorganic chemistry. Topics can vary but reflect the expertise of the instructor and the research interests of the student(s).

CHEM 6622 Advanced Topics in Inorganic Chemistry

3 credit hours

Current topics and applications of inorganic chemistry will be covered, and may include the following: cluster chemistry, chemistry of the lanthanides and actinides, inorganic and organometallic materials, bioinorganic chemistry and inorganic photochemistry. This is a modified version of undergraduate course CHEM 4422. Students attend the undergraduate lectures and are expected to complete at least the course requirements of the undergraduate course as well as any supplementary graduate requirements as specified by the instructor.

CHEM 6631 Selected Topics in Analytical Chemistry

6 credit hours

This is a graduate-level directed study course in a specific area of analytical chemistry. Topics can vary but reflect the expertise of the instructor and the research interests of the student(s).

CHEM 6632 Instrumental Analysis I

3 credit hours

Emphasis will be placed on chemical separations and separation techniques. This is a modified version of undergraduate course CHEM 3432. Students attend the undergraduate lectures and are expected to complete at least the course requirements of the undergraduate course and any supplementary graduate requirements as specified by the instructor.

CHEM 6633 Instrumental Analysis II

3 credit hours

Emphasis will be placed on X-ray spectrometry, microscopy, and analog circuits. This is a modified version of undergraduate course CHEM 4443. Students attend the undergraduate lectures and are expected to complete at least the course requirements of the undergraduate course and any supplementary graduate requirements as specified by the instructor.

CHEM 6641 Selected Topics in Analytical Chemistry

6 credit hours

This is a graduate-level directed study course in a specific area of organic chemistry. Topics may include organic synthesis, stereochemistry, heterocyclic compounds and natural products, and reflect the expertise of the instructor and the research interests of the student(s).

CHEM 6643 Organic Reaction Mechanisms

3 credit hours

A study of the more important mechanisms of reactions of organic molecules and the methods by which they are elucidated: applications of kinetic data, isotope effects, linear free energy relationships, orbital symmetry control and acid and base catalysis. This is a modified version of undergraduate course CHEM 3443. Students attend the undergraduate lectures and are expected to complete at least the course requirements of the undergraduate course as well as any supplementary graduate requirements as specified by the instructor.

CHEM 6644 Synthesis in Organic

3 credit hours

A study of the principles involved in the planning and execution of the synthesis of organic molecules. Laboratory experiments are designed so that students learn to identify their products by the use of spectroscopic and other techniques. This is a modified version of undergraduate course CHEM 4444. Students attend the undergraduate lectures and are expected to complete at least the course requirements of the undergraduate course as well as any supplementary graduate requirements as specified by the instructor.

CHEM 6645 Organic Spectroscopy

3 credit hours

An advanced course on interpretation of ^1H and ^{13}C nuclear magnetic resonance spectra. Infrared spectroscopy, mass spectrometry, and ultra-violet spectrophotometry will also be applied to the problems of organic and organometallic structural determination. This is a modified version of undergraduate course CHEM 3445. Students attend the undergraduate lectures and are expected to complete at least the course requirements of the undergraduate course as well as any supplementary graduate requirements as specified by the instructor.

CHEM 6651 Biochemistry

3 credit hours

This course reviews and/or presents an advanced course on the chemistry and biochemistry of macromolecules such as proteins, enzymes, simple and complex carbohydrates, lipids, nucleic acids, and coenzymes. A relationship between the molecular structure of a given macromolecule, its properties, and its function in the living system is explored. The laboratory work concentrates on the isolation, purification, and analysis of naturally occurring macromolecules and includes study of their properties, using micro chemical measurements. This is a modified version of undergraduate course CHEM 3451. Students attend the undergraduate lectures and are expected to complete at least the course requirements of the undergraduate course as well as any supplementary graduate requirements as specified by the instructor.

CHEM 6652 Biochemistry: Metabolism

3 credit hours

A course presenting principles of metabolism of biomolecules involved in energy production, formation of biosynthetic substrates and metabolism of nucleic acids. Both catabolic and anabolic processes as well as transport of biomolecules within cells and organs are considered. This is a modified version of undergraduate course CHEM 4452. Students attend the undergraduate lectures and are expected to complete at least the course requirements of the undergraduate course as well as any supplementary graduate requirements as specified by the instructor.

CHEM 6653 Selected Topics in Biochemistry

6 credit hours

This is a graduate-level directed study course in a specific area of biochemistry. Topics can vary but reflect the expertise of the instructor and the research interests of the student(s).

Computing and Information Systems (CISY)

CISY 6624 Database Systems

3 credit hours

Students will examine the design, implementation and management issues associated with database systems. The problems which arise through incorrectly designed databases are identified and their resolutions discussed. Topics on transaction processing and databases on the WWW are also covered. Labs based on an RDBMS package are given to provide a vehicle for practical implementation.

CISY 6636 Decision Support Systems

3 credit hours

Students explore decision support systems (DSS), computer applications specifically designed to support and enhance user decision-making. Topics include: DSS examples (expert systems, BI systems, data mining, and others), architecture, design issues, and implementation using Visual Basic programming in MS Excel.

CISY 6690 Seminar in Computing and Information Systems

3 credit hours

This course deals with selected topics in computing and information systems. It is offered when in sufficient demand, and specific topics covered may vary depending on the interest of the students and instructor.

CISY 6692 Directed Study in Information Systems

3 credit hours

Intended to supplement or provide an alternative to the regular computing and information systems courses in order to meet the special needs and interests of students, the course provides an opportunity to study a particular subject in detail and requires from the student some measure of independence and initiative.

CHEM 6690 - 6699 Directed Study in Chemistry

3 credit hours

These courses are intended to supplement the course offerings in chemistry and allow students to delve deeper into a subject of particular interest to them. Students must show some initiative and be willing to work independently.

Computing Science (CSCI)

CSCI 6623 Cryptography

3 credit hours

An advanced course in the various aspects of data security. Possible topics: classical encryption methods such as Vignere and Vernan ciphers; the Data Encryption Standard; key distribution methods and public key encryption; and authentication using digital signatures. Applications of these methods in the design of protocols for data privacy and security will also be studied.

CSCI 6651 Theory of Computation

3 credit hours

An advanced course in some of the fundamental theoretical concepts in computing science. Students will be introduced to the concepts of decidable, P, NP, NP-complete, and NP-hard problems. Two classes of languages of interest to computing scientists, namely, regular and context free languages, and corresponding automata for recognizing these languages, will also be studied. A brief discussion on the semantics of programming languages will be included. The concept of automata will be further extended using Turing machines. Turing machines will be used to explore the concept of decidability along with examples of decidable and undecidable problems.

CSCI 6652 Algorithm Analysis

3 credit hours

Some of the key techniques of efficient algorithm design that will be discussed: divide and conquer; greedy methods; dynamic programming; graph traversal; and change of representation. Measuring algorithm performance and lower bounds for various problems will be studied. An introduction to complexity theory-P, NP, polynomial time reducibility, and NP-completeness- will also be provided.

CSCI 6661 Database Systems

3 credit hours

An advanced course in the design, implementation, use and maintenance of databases. Topics will include: data models such as the entity-relationship model, the relational model, and the object-oriented model; relational languages such as relational algebra, relational calculus, and SQL; the theory of normal forms of database design; use of indexes for efficient data retrieval; and database implementation using a commercial database management system. Other topics may be included, such as query optimization, database control, and distributed database systems.

CSCI 6663 Numerical Software

3 credit hours

This course will study the software development process in the area of numerical software. Emphasis will be placed on software development and implementation aspects of a variety of numerical algorithms. The course will also examine a substantial number of software packages including some which are currently available in some of the large commercial software libraries, as well as a number of published software packages which have yet to appear in libraries and even a few experimental codes which have not yet appeared in the literature. The main project in the course will be the development of a large software package by the class working in programming teams in a selected area of numerical algorithms. Other projects to be undertaken during the course include the modification of one or more existing mathematical software packages and the critical analysis of several existing software packages. A number of assignments related to the software packages considered will also be given.

CSCI 6671 Computer Graphics

3 credit hours

This course provides an overview of the principles and methodologies of computer graphics, including the representation, manipulation, and display of two- and three-dimensional objects. Subtopics may include characteristics of display devices (i.e., raster, vector); representing primitive objects (lines, curves, and surfaces) and composite objects; two- and three-dimensional transformations (translation, rotation, scaling); hidden lines and surfaces; shading and colouring; interactive graphics and the user interface; animation techniques.

CSCI 6674 Information Retrieval

3 credit hours

This course considers manipulations on a bibliographic database. Topics to be covered include an introduction and basic definitions, inverted file structures, automatic indexing, prototype systems, retrieval and refinements and natural language processing.

CSCI 6676 Computer Vision and Digital Image Processing

3 credit hours

An advanced course in the concepts used in computer vision and digital image processing. Computer vision techniques extract information from an image, while image processing techniques modifies the image for viewing by the human eye. Topics covered include the following: sampling and resolution, image processing, edge detection, segmentation, discrete image transforms, restoration and enhancement, and image compression.

CSCI 6677 Intelligent Data Mining

3 credit hours

Data mining refers to a family of techniques used to detect interesting knowledge in data. With the availability of large databases to store, manage and assimilate data, the new thrust of data mining lies at the intersection of database systems, artificial intelligence and algorithms that efficiently analyze data. The course will use concepts from pattern recognitions, statistics, data analysis and machine learning. The size of databases and high complexity of techniques present many interesting computational challenges.

CSCI 6682 Artificial Intelligence

3 credit hours

An advanced course in artificial intelligence (AI). The course will consider philosophical, mathematical, experimental, and implementation aspects of such topics as problem solving, searching, game playing, genetic algorithms, learning, neural networks, natural language processing, vision, knowledge representation, logic, expert systems, reasoning under uncertainty, fuzzy sets, planning, and robotics. In addition to a theoretical introduction, students will also gain experience using one or more of the popular AI tools.

CSCI 6691 - 6699 Special Topics in Computing Science

3 credit hours

This course covers advanced topics in computing science chosen according to the interests of the students and instructor, and requires some measure of independence and initiative from the student.

Engineering (EGNE)**EGNE 6690-6699 Directed Study in Engineering**

3 credit hours

These courses are intended to supplement the course offerings in engineering and allow students to delve deeper into a subject of

particular interest to them. Students must show initiative and be willing to work independently.

Entrepreneurship (ENTR)**ENTR 6687 New Venture Opportunities**

3 credit hours

Students are led through the development of the major elements required for a business plan for a new venture, as well as developing an appreciation for new venture growth in the economy. As a planning and financing tool, the business plan outlines in detail and specifically finance, management and the overall feasibility of a possible new venture. Attention is given to customizing the plan to specific requirements of different financing (e.g., venture capital, bank finance, angel investors).

Environmental Science (ENVS)**ENVS 6470 Environmental Remediation and Restoration**

3 credit hours

Current approaches to remediating damaged ecosystems, including such topics as mine reclamation, invasive species control, ecological restoration and constructed ecosystems are examined. Emphasis is placed on the scientific and socioeconomic bases for remediation and restoration, including the following: theoretical approaches, the role of traditional ecological knowledge; gaps between theory and practice; and hands-on training in local ecological restoration projects.

ENVS 6487 Environmental Contaminants

3 credit hours

The focus of this course is on key environmental contaminants, including mercury, other metals, and selected volatile organic compounds. Emphasis is placed on experiential approaches, including field work and laboratory research, to study these environmental contaminants. Students are expected to participate in the critical analyses of literature, and in the discussion and presentation of their own research results.

ENVS 6620 Restoration Ecology

3 credit hours

This course offers an advanced treatment of contemporary issues in restoration ecology, including conservation genetics, invasive species, phytoremediation, restoration ethics, and ecological integrity. Experiential learning is emphasized and there may be opportunities for hands-on experience in actual restoration projects or in experimental microcosms. Students will also develop scientific writing skills by writing real grant proposals or review papers.

ENVS 6650 Natural Resource Management

3 credit hours

This interdisciplinary course examines the management of natural resource industries such as fisheries, forestry, mining and energy, focusing on interactions between biophysical, ecological, socioeconomic, and technological components. The course will cover such topics as sustainable development and environment-economy interactions in the resource sector; approaches to integrated natural resource development; theoretical and practical aspects of managing resources and resource industries; economics of sustainable resource use; methods for analyzing the impacts of resource use.

ENVS 6660 Environmental Pattern Analysis

3 credit hours

Students focus on theory and practical methods for characterizing the structural and dynamic features relating to environmental systems. Practical applications include environmental systems related to rivers, lakes, coastal areas, fisheries, forests, ecosystems, underground mineral distribution, atmospheric variables (wind, temperature), and pollution. Classes 3 hrs. and lab 3 hrs. per week.

ENVS 6690 - 6699 Directed Studies in Environmental Science

Students will pursue a short term research project in such areas as: oceanographic sampling and analysis, policy development or environmental impact assessment. Students must identify an appropriate supervisor; provide a project proposal; and at the end of the project, submit a written report.

Forensic Science (FRSC)

FRSC 6690-6699 Special Topics in Forensic Sciences

3 credit hours

This course covers advanced topics in forensic science chosen according to the interests of the students and instructor, and requires some measure of independence and initiative from the student.

Geography (GEOG)

GEOG 5623 Glaciers and Glaciation

3 credit hours

Glaciers have profound effects on landscapes and are an important component of global physical systems. Glaciology, causes and records of fluctuations in glacial coverage, glacial processes, glacial landforms, and the legacy of past glacial activity on earth will be examined. Broader impacts of glacial activity and changes on humans and the environment will also be investigated. Classes 3 hours and lab 3 hours a week

GEOG 5632 Social Geography of The City

3 credit hours

Examines the location of residential areas in cities, and the differentiation and segregation of those areas by income, occupation, race, ethnic status, and religion. Emphasis is placed on the historical evolution of social patterns, on the link between social areas and the physical fabric of the city, on competition between groups for amenity locations and facilities, and on the conflicts over noxious facilities.

GEOG 5636 Advanced Remote Sensing

3 credit hours

A course in advanced topics in remote sensing building upon the basic concepts and image processing skills learned in GEOG 3356. At the advanced level, remote sensing involves more numerical processing and statistical analysis, and greater understanding of physical principles of remote earth observation. Recent studies in remote sensing will be examined and discussed critically. Students will develop projects based on their background and interests using remote sensing for applied studies.

GEOG 5639 Urban Historical Geography

3 credit hours

The geography of the city (its morphology and function) is employed as an indication of the landscape impression produced by various historical periods (conceived as cultures) during the evolution of urban forms in Europe and North America. Examples are taken in historical sequence from Greek to Industrial times.

GEOG 5642 Urban Planning

3 credit hours

Examines the physical and environmental planning of urban areas, with special reference to current practice in Nova Scotia. Topics include the emergence of modern town planning, the Planning Act, planning process, structure plans, general and partial urban allocation models, municipal plans, zoning, subdivision control, site planning, urban renewal, and new towns. The costs and benefits of planning are appraised.

GEOG 5643 Natural Hazards

3 credit hours

This course considers natural hazards as a part of human-environment relations characterized by changing geographical patterns. Earthquakes, volcanic eruptions, landslides, severe weather, floods, coastal hazards, extraterrestrial body impacts are analyzed in a multi-scale perspective, along with their functional relationships. The human impact of natural hazards is discussed, with an emphasis on environmental perception, public awareness and action. Possibilities of forecasting are examined, as well as risk assessment and mitigation strategies.

GEOG 5686 Concepts in Geographic Information Systems (GIS) Analysis

3 credit hours

Students focus on applied geospatial analyses using ArcGIS and associated extensions. Topics include spatial analysis and geostatistics, 3D surface modelling, visualization, network analysis, predictive modelling and multiple criteria evaluations. Examples will be drawn from earth and environment science, geography, environmental studies, anthropology and business. Classes 3 hours and lab 3 hours a week

GEOG 5696 Applications in Geographic Information Systems

3 credit hours

This course is project oriented. Students focus on the use of either geographic information systems (GIS) or remote sensing to address practical problems in areas such as resource management, marketing, regional planning, natural hazards and geomorphology. Students undertake a major research project using various GIS analytical functions, and develop skills relating to data creation, manipulation, quality assessment and presentation. Classes 3 hours and lab 3 hours a week

GEOG 6602 Directed Studies in Urban/Regional Geography

6 credit hours

A directed studies course on topics involving urban and regional geography.

GEOG 6603 Directed Studies in Environmental Geography

6 credit hours

A directed studies course on topics involving environmental geography.

GEOG 6604 Directed Studies in Marine Geography

6 credit hours

A directed studies course on topics involving marine geography.

GEOG 6605 Directed Studies (General)

6 credit hours

A directed studies course on general topics in geography.

GEOG 6612 Directed Studies in Urban/Regional Geography

3 credit hours

A directed studies course on topics involving urban and regional geography.

GEOG 6613 Directed Studies in Environmental Geography

3 credit hours

A directed studies course on topics involving environmental geography.

GEOG 6615 Directed Studies (General)

3 credit hours

A directed studies course on general topics in geography.

GEOG 6624 Directed Studies in Marine Geography

6 credit hours

A directed studies course on topics involving marine geography.

GEOG 6690 - 6699 Directed Study in Geography

3 credit hours

These courses are intended to supplement the course offerings in geography and allow students to delve deeper into a subject of particular interest to them. Students must show some initiative and be willing to work independently.

Geology (GEOL)

GEOL 6400 International Field Camp

3 credit hours

This course is offered on an irregular basis in the form of a Geology field trip abroad, allowing the students to be exposed to geological features that cannot be found in Canada. In practical terms, this course will acquaint the student with modern methods of structural, stratigraphic, petrologic and/or geophysical analysis. After mastering these skills, students will undertake an independent geological report project. Students may be required to travel at their own expense.

GEOL 6414 Tectonics

3 credit hours

This course describes the major features of the Earth and its place in the solar system. The evidence for plate tectonics, the analysis of plate movements, and the characteristic rock associations formed in different tectonic environments are presented. Aspects of global change will be considered, including the evolution of tectonic processes through geologic time, changes in the atmosphere and oceans, and the importance of meteorite impacts.

GEOL 6441 Mineral Resources

3 credit hours

A study of Earth's mineral resources, their classification, genesis and distribution in time and space. Important examples from Canada and abroad will be discussed. Topics will also include mineral exploration techniques, mining methods, metallurgical recovery, net smelter return, and ore reserve estimation/classification. Laboratories will examine a variety of base and precious metal ore deposit types. Mining/exploration practice and resource exploitation are also examined in terms of their environmental impacts.

GEOL 6450 Advanced Igneous and Metamorphic Petrology

3 credit hours

The topics covered in this course include magmatic petrogenesis; magma types; petrographic provinces and their relations to their tectonic setting; differentiation indices; variation diagrams; distribution trends of major and trace elements; equilibrium and fractional crystallization in selected synthetic systems; phase equilibria in metamorphic systems; reaction balancing methods; porphyroblast-matrix relations; quantification of pressure-temperature-time trajectories. Laboratory work is centered on the acquisition and manipulation of microprobe data.

GEOL 6465 Advanced Sedimentology

3 credit hours

This course examines current research on sedimentary rocks and basins and the methods used to understand them. The course is taught as a series of modules by multiple instructors who introduce the students to selected areas of research. Among the topics to be covered are modern carbonate and evaporite environments, exotic chemical sedimentary rocks and diagenetic cements, volcanogenic sedimentary rocks, sequence stratigraphy in carbonate and siliciclastic successions, applications of ichnology (trace fossils), the use of stable isotopes in the study of terrestrial carbonates, and the use of detrital minerals to interpret basin evolution.

GEOL 6654 Applied Geochemistry

3 credit hours

The application of graphical and numerical tools for classifying Earth materials according to their chemical composition is studied through field-based and computer-based laboratories. This course examines geochemical sampling, instrumental analysis, statistical evaluation of real geochemical data, and the methods of proper reporting and quality control. The students are introduced to novel methods (fluid inclusion microanalysis, alteration mapping in ore deposits, reaction path modeling) and their application in characterizing geochemical processes on Earth.

GEOL 6666 Petroleum Geology

3 credit hours

The origin, migration and accumulation of oil and natural gas. Types of oil bearing structures and basic principles in oil exploration.

GEOL 6690 - 6699 Directed Studies in Geology

3 credit hours

Intended to supplement or provide an alternative to the regular geology courses in order to meet the special needs and interests of students. The course provides an opportunity to study a particular subject in detail and requires from the student some measure of independence and initiative.

Management Science (MGSC)

MGSC 6603 Statistical Applications in Management Science

3 credit hours

This course brings together many of the theories and skills which the student has learned and uses them in designing, conducting, analyzing, and reporting the results of research designs. Statistical techniques used are: chi-square, analysis of variance, and multiple regression. Extensive use is made of computer-oriented statistical packages.

MGSC 6615 Strategic Design and Improvement of Operations

3 credit hours

This course is aimed at the student who wants to deepen their understanding of the strategic role of operations and the design of operations to facilitate competitive advantage in both service and production environments. The strategic design and improvement of operations will be examined in the context of key performance priorities such as: cost, quality, flexibility, delivery, and time. Topics include: process design and improvement, implementation of operations improvement strategies, and integration of information technology and operations systems. The course will make significant use of cases and group work.

MGSC 6618 Total Quality Management

3 credit hours

This course introduces the student to the concepts of total quality management, quality improvement, and statistical quality control as key ingredients of a quality strategy. The role of a quality strategy in improving the competitiveness of the firm in both local and international markets is emphasized. Using a case-oriented approach, students will be introduced to the philosophies of Deming, Juran and Crosby, the dimensions of product and service quality, modern statistical improvement tools, and the relationship between quality strategy and the functional areas of the firm.

interest to them. Students must show some initiative and be willing to work independently.

MGSC 6690 Seminar in Management Science

3 credit hours

This course deals with selected topics in management science. It is offered when in sufficient demand, and specific topics covered may vary depending on the interests of students and instructor.

MGSC 6692 - 6699 Directed Study in Management Science

3 credit hours

Intended to supplement or provide an alternative to the regular management science courses in order to meet the special needs and interests of students, these courses provides an opportunity to study a particular subject in detail and requires from the student some measure of independence and initiative.

Mathematics (MATH)

MATH 6690 - 6699 Directed Study in Mathematics

3 credit hours

This course is intended to supplement or provide an alternative to the regular mathematics courses in order to meet the special needs and interests of students. The course provides an opportunity to study a particular subject in detail and requires from the student some measure of independence and initiative.

Physics (PHYS)

Students should consult with the supervisor and the program representative before registering for any of these courses.

PHYS 6701 Radiation Detection Techniques

3 credit hours

This course introduces the students to sources of radiation and some of the basic detection techniques. The topics may include interaction of radiation with matter, general detector characteristics, and introduction to gas filled detectors, semiconductor detectors and scintillator detectors.

PHYS 6790-6799 Special Topics in Physics

3 credit hours

This course covers advanced topics in physics chosen according to the interests of the students and instructor, and requires some measure of independence and initiative from the student.

Psychology (PSYC)

PSYC 6790 - 6799 Directed Study in Psychology

3 credit hours

These courses are intended to supplement the course offerings in psychology and allow students to delve deeper into a subject of particular