BCH 261

Course ID 023892

Short Title Biochemistry

Long Title Biochemistry

Long Descr This course deals with the structure, function and chemistry of the molecular building blocks of the cell. This includes a discussion of water and its properties, amino acids, proteins, nucleotides and nucleic acids, carbohydrates and lipids. Also included is an introduction to enzyme function and kinetics. The laboratory provides an introduction to the basic biochemical techniques including chromatography, electrophoresis and spectrophotometry. (Formerly CHY 261).

Academic Org Chemistry and Biology

Components Lecture: 3.00 / Laboratory: 3.00

Requisites Prerequisites: BLG143 and CHY142; Antirequisites: CHY 204 and CHY 205
Equivalencies BCH 261/CHY 261

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BCH 361

Course ID 023893

Short Title Advanced Biochemistry I

Long Title Advanced Biochemistry I

Long Descr A course in the principles of enzymology, bioenergetics and carbohydrate metabolism. Enzymology topics include the structure, function and regulation of enzymes and Michaelis-Menten kinetics. The fundamentals of bioenergetics and intermediary metabolism are discussed in the context of the integration and control of catabolism and anabolism. The course concludes with a detailed examination of carbohydrate chemistry with emphasis on the chemical logic and the regulation of these pathways. The laboratory introduces students to more advanced biochemical techniques. Topics include the isolation and characterization of polysaccharides and the kinetic analysis of enzymes. (Formerly CHY 361).

Academic Org Chemistry and Biology

Components Lecture: 3.00 / Laboratory: 3.00

Requisites Prerequisite: BCH 261
Equivalencies BCH 361/CHY 361

Attributes Case Studies, Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0

Repeat for Credit N
Total Completions 1
Course Topics

BCH 461

Course ID 024765

Short Title Biochemistry of Disease

Long Title Biochemistry of Disease

Long Descr This course will examine the etiology and pathogenesis of biochemical disorders of diseases. The course will include applications of biochemistry, chemistry and immunology as they relate to the diagnosis, therapy, and monitoring of human disease.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisites: BLG 400, BCH 361
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BCH 463

Course ID 025249

Short Title Advanced Biochemistry II

Long Title Advanced Biochemistry II

Long Descr The major topics examined are membrane structure and transport systems and cellular metabolic pathways. A review of DNA replication and protein synthesis will also be included. A detailed examination of the metabolism of lipids, proteins and nucleic acids is investigated in the context of normal function in various organisms. The contribution of disrupted metabolism to human diseases such as cancer and diabetes is also discussed.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisite: BCH 361; Antirequisite: BCH 362
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BCH 501

Course ID 023926

Short Title Protein Biochem and Proteomics

Long Title Protein Biochem and Proteomics

Long Descr In depth examination of protein structure and function, tools for determining biochemical function and structure, analysis of protein-protein interactions, regulatory mechanisms, introduction to high throughput identification and quantification of protein expression; application of proteomics to drug design.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisites: BCH 261
Equivalencies

Attributes Research Project
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BCH 550

Course ID 024746

Short Title Glycobiology

Long Title Glycobiology

Long Descr This course deals with the role of carbohydrates and their conjugates in biology and disease. Topics will include the monosaccharide building blocks and their linkages, glycoconjugates (glycoproteins, glycolipids and proteoglycans), their physiological functions and how they are synthesized. The roles of carbohydrate receptors in molecular recognition, the roles of lectins and other specialized carbohydrate binding proteins: glycobiology of microbes, viruses and plants; glycobiology and disease; glycans as renewable bio-energy sources.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisites: BLG 311 and BCH 261
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BCH 560

Course ID 024948

Short Title Protein Structure and Function

Long Title Protein Structure and Function

Long Descr This course will provide a set of key concepts that govern a true understanding and appreciation of why proteins are the workhorses of the cell. Students will be exposed to these concepts in both traditional lecture and presentation environments. Some of the key concepts will include: 1) understanding basic protein structure elements and how they play a role in function, 2) methods for protein structure determination and visualization including an introduction to the use of Pymol, 3) enzyme mediated chemical reactions, and 4) binding proteins and their role in signaling.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisite: BCH 261
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1

Course Topics

BCH 580

Course ID	023242
Short Title	Cell Signalling
Long Title	Cell Signalling
Long Descr	The course examines mechanisms of signal transduction and intracellular signalling. We will first examine the biochemical tools of signalling pathways including receptor families and their ligands, second messengers, G-Proteins and protein phosphorylation switches. We will then investigate the signalling pathways and networks in biological functions, which may include stress-response, blood pressure control, cell growth, cell migration, and the immune response.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00
Requisites	Prerequisite: BCH 261 and BLG 411
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

BCH 880

Course ID 025250

Short Title Advanced Biochemistry Lab

Long Title Advanced Biochemistry Laboratory

Long Descr This course will cover experiments on the study and characterization of proteins, with a particular focus on membrane proteins. The lab experience includes experiments for protein solubility, electrophoresis, as well as detection of proteins by glycoprotein staining and western blotting. Other protein detection methods examined in this course will include enzyme-linked immunoassays (ELISA). Students will also give presentations on emerging methodologies.

Academic Org Chemistry and Biology

Components Laboratory: 3.00

Requisites Prerequisite: BCH 361; Corequisite: BCH 463
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BLG 40A

Course ID 020710

Short Title Project-Thesis-A

Long Title Project-Thesis-A

Long Descr A research project supervised by a faculty member. An oral presentation of results and a thesis are required. Registration in this course may be restricted by the number of available projects. See teaching department for consent criteria.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites
Equivalencies

Attributes Research Project
Dept Consent Department Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Multi-Term Course: Not Graded
Hegis Code
GPA Weight 0.00/0.00
Billing Units 1.0
Course Count 0.0
Repeat for Credit N
Total Completions 1
Course Topics

BLG 40B

Course ID 020711

Short Title Project-Thesis-B

Long Title Project-Thesis-B

Long Descr A research project supervised by a faculty member. An oral presentation of results and a thesis are required. Registration in this course may be restricted by the number of available projects.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisite: BLG 40A
Equivalencies BLG40B/BLG40

Attributes Research Project
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 2.00/2.00
Billing Units 1.0
Course Count 2.0
Repeat for Credit N
Total Completions 1
Course Topics

BLG 101

Course ID 026632

Short Title Anatomy and Physiology I

Long Title Anatomy and Physiology I

Long Descr A comprehensive investigation into the cells and tissues of the human body. Specific content will include homeostasis and how it is maintained in the healthy human body. An exploration of cellular physiology and the nucleus as the control center of the cell will set the stage for the semester. Following this, an investigation into the four primary tissues of the body (epithelium tissue, connective tissue; muscle tissue, and nervous tissue), and the basics of the nervous system. This course is not available for credit in the Bachelor of Science programs in Biology, Biomedical Science or Chemistry.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Corequisites: NSE 101, NSE 111, PPN 101 (for Collaborative Nursing program students only); Not available to students in Bachelor of Science programs in Biology, Biomedical Science or Chemistry; Antirequisite: BLG 10B
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BLG 111

Course ID	026633
Short Title	Anatomy and Physiology II
Long Title	Anatomy and Physiology II
Long Descr	A comprehensive investigation into the major organ systems of the body. Specific content will include:cardiovascular (blood, heart and blood vessels), respiratory, gastrointestinal including nutrition, urinaryincluding fluid/electrolyte and acid/base balance, reproduction and pregnancy including heredity. This course is not available for credit in the Bachelor of Science programs in Biology, Biomedical Science or Chemistry.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00
Requisites	Prerequisites: BLG 101, NSE 101, NSE 111, PPN 101 (NSE and PPN courses for Nursing students only); Not available to students in Bachelor of Science programs in Biology, Biomedical Science or Chemistry
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

BLG 131

Course ID 026634

Short Title Microbiology for Nursing

Long Title Microbiology for Nursing

Long Descr This course will introduce the students to the fundamentals of microbiology. They will study bacteria, viruses, fungi and protozoans and their role in the acquisition and dissemination of infectious diseases. The students will also learn how microbial infections are controlled by hygiene, antimicrobial therapies and the immune system. Infections of each of the body systems will be surveyed. The lecture material will be supplemented with case histories in order to simulate real world situations.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisites: PPN 201, NSE 203, NSE 211, PAT 201, NSE 212; Corequisites: PPN 202, PAT 202, NSE 222, NSE 221

Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BLG 143

Course ID 005582

Short Title Biology I

Long Title Biology I

Long Descr This course is an introduction to the cellular and molecular mechanisms in the cell. Topics include macromolecule structure and function, enzymes, cell membrane structure and function, cell cycle control, cell division, metabolism, and photosynthesis. Also included is an introduction to genetics and patterns of inheritance, gene expression and developmental biology. Laboratory exercises complement lectures.

Academic Org Chemistry and Biology

Components Lecture: 3.00 / Laboratory: 1.50

Requisites
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BLG 144

Course ID	005688
Short Title	Biology II
Long Title	Biology II
Long Descr	This course is an introduction to evolution, diversity, and ecology. Topics include natural selection and the patterns of evolutionary change in allele frequencies and speciation. The course will introduce the diversity of living organisms resulting from evolutionary processes. The course will explore how these organisms interact with each other and their physical environment, and the feedback of these interactions on evolution. Laboratory exercises complement lectures.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00 / Laboratory: 1.50
Requisites	Prerequisite: BLG 143
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

BLG 151

Course ID 000941

Short Title Microbiology I

Long Title Microbiology I

Long Descr This course introduces the student to the principles of microbiology. Topics include the history of microbiology, a survey of the different types of microorganisms, prokaryotic cell structure and function, microbial nutrition and growth, microbial metabolism and its applications, and bacterial genetics and gene expression. An introduction to bacterial gene expression will also be covered. The laboratory exercises complement the lectures and introduce the student to basic microbiological techniques and applications.

Academic Org Chemistry and Biology

Components Lecture: 3.00 / Laboratory: 3.00

Requisites Prerequisite: BLG 143 and BLG 144

Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BLG 181

Course ID 022349

Short Title Biology of a Living City

Long Title Biology of a Living City

Long Descr This course will examine current selected topics in biology including cloning, today's epidemics, genetically modified foods and environmental issues. Students will be introduced to many fundamental principles of modern biology as well as the history and ethics pertaining to the topics. This course is open to all arts students and has no secondary school biology requirement. (Formerly SCI 181). BLG 181 is not available for credit to students who choose BLG 143 or BLG 144.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Not available to Faculty of Engineering, Biology (all options), Biomedical Sciences (all options), Chemistry (all options), nor Medical Physics (all options); Antirequisites: BLG 143, BLG 144

Equivalencies

Attributes Lower Level Liberal Studies
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1

Course Topics

BLG 230

Course ID	023243
Short Title	Botany
Long Title	Botany
Long Descr	Topics include plant systematics at morphological and genetic levels, plant development and life cycles, and nutrient requirements for growth. Photosynthesis and primary metabolism of C3, C4 and organic acid plants will be compared. Basic physiology including hormonal regulation, ion transport, and water relations will be presented. Secondary metabolites including phytochemicals, drugs, toxins and pigments will be introduced. Laboratory exercises include germination, growth requirements, flower dissections, measurements of tissue nutrients, creation of cuttings and controlled crosses.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00 / Laboratory: 1.50
Requisites	Prerequisite: BLG 143 and BLG 144
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

BLG 251

Course ID	000022
Short Title	Microbiology II
Long Title	Microbiology II
Long Descr	This course introduces the student to more in depth information about the microbial world. Students will be introduced to the fascinating diversity of prokaryotes and viruses as well as to techniques used for determining microbial identity. The impact of microorganisms on the world around us will then be discussed including microbial interactions with the environment and humans, control of microorganisms, and applications of microorganisms. Laboratory exercises complement the lectures and familiarize the student with principles of microbial ecology and diversity.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00 / Laboratory: 1.50
Requisites	Prerequisite: BLG 151
Equivalencies	
Attributes	Case Studies
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

BLG 307

Course ID	000387
Short Title	Molecular Biology
Long Title	Molecular Biology
Long Descr	This course emphasizes the fundamentals of molecular biology including gene structure and function, regulation of transcription and translation, gene expression in both prokaryotes and eukaryotes, and recombinant DNA technology including DNA mutagenesis, protein engineering and monoclonal antibody technology.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00
Requisites	Prerequisite: BLG 151 and BCH 261
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

BLG 311

Course ID	010212
Short Title	Cell Biology
Long Title	Cell Biology
Long Descr	This course will examine key concepts of cell structure and function. This includes membrane structure and function, membrane transport mechanisms of small molecules and ions, cytoplasmic organization, intracellular targeting and sorting of proteins, membrane trafficking, the cytoskeleton and nuclear organization. We will also examine various methods used to visualize and study cell structure and function.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00
Requisites	Prerequisite: BLG 143 and BLG 144
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

BLG 312

Course ID 023244

Short Title Invertebrate Zoology

Long Title Invertebrate Zoology

Long Descr This course is an introduction to the vast world of invertebrate organisms. Three major aspects will be presented for each group of invertebrates: 1) ontogeny and phylogeny will look into evolutionary history, diversity, and relationships among groups, with a strong emphasis on genetics of these organisms: 2) functional morphology will provide an understanding of the role of the myriads of morphological adaptations found among invertebrates: and 3) ecological roles of invertebrates in specific habitats.

Academic Org Chemistry and Biology

Components Lecture: 3.00 / Laboratory: 1.50

Requisites Prerequisite: BLG 143 and BLG 144 and BLG 316
Equivalencies

Attributes Case Studies
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BLG 315

Course ID 024330

Short Title Evolution

Long Title Evolution

Long Descr The mechanisms of evolutionary change, from genes to societies, will be examined in this course and will draw on data and examples from plants and invertebrate and vertebrate animals. How natural selection interacts with genetic and population processes to make organisms adapted to their environment and to create biological diversity is an important component. An exploration of higher-level processes in evolution including considerations of mechanisms of speciation, extinction, adaptive radiation, and phylogenetics will be conducted.

Academic Org Chemistry and Biology

Components Lecture: 3.00 / Laboratory: 1.50

Requisites Prerequisites: BLG 143 and BLG 144 and BLG 400
Equivalencies

Attributes Case Studies
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BLG 316

Course ID	024331
Short Title	Zoology
Long Title	Zoology
Long Descr	The branch of biology that deals with animals and animal life, including the study of the structure, physiology, development, and classification of animals will be introduced in this course. Unicellular organisms including the protozoa will be examined, followed by the aquatic and terrestrial invertebrates, and culminating in an overview of the vertebrate group will emphasize the diversity of this enormous Kingdom.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00 / Laboratory: 1.50
Requisites	Prerequisites: BLG 143 and BLG 144
Equivalencies	
Attributes	Case Studies
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

BLG 340

Course ID	003469
Short Title	Environmental Biology
Long Title	Environmental Biology
Long Descr	This course covers the relationships of organisms, particularly microorganisms, with their environment. Topics covered include population interactions, environmental determinants, biogeochemical cycling and microbial contribution to pollution. Applications to waste management and pollution control will be discussed. Laboratory exercises complement lectures.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00 / Laboratory: 3.00
Requisites	Prerequisites: BLG 151 and BLG 567 and CHY 113
Equivalencies	
Attributes	Case Studies, Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

BLG 351

Course ID	005005
Short Title	Applied Microbiology
Long Title	Applied Microbiology
Long Descr	This course covers the fundamentals and applied aspects of industrial processes employing microbial, plant and animal systems. Topics include strain development, bacterial and yeast fermentations, and the production of chemicals, antibiotics, vitamins and enzymes. Applications to the food and pharmaceutical industry, agriculture and the environment will be examined.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00
Requisites	Prerequisite: BLG 151
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

BLG 400

Course ID 010162

Short Title Genetics

Long Title Genetics

Long Descr Structure, function and transmission of genes; chromosomal basis of inheritance; mono- and dihybrid crosses; sequential steps in gene function; linkage maps; sex chromosome inheritance, cytogenetics, genetic traits and inheritance as they relate to health care issues. Topics include normal and pathological cytology; the human genome project; gene mapping; linkage and therapy.

Academic Org Chemistry and Biology

Components Lecture: 3.00 / Tutorial: 1.00

Requisites Prerequisites: BLG 143 and BLG 144
Equivalencies

Attributes Case Studies
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BLG 401

Course ID 002172

Short Title Ecotoxicology

Long Title Ecotoxicology

Long Descr Ecotoxicology is the study of the fate of chemicals in the environment and their effects on the ecological systems. The course will examine the origin, fate, and the potential impact of some of these chemicals derived from the human activities on natural ecosystems, including the aquatic and terrestrial environments. Organisms of interest will include the microbial community, primary producers, aquatic and terrestrial invertebrates and vertebrates and lastly terrestrial mammals.

Academic Org Chemistry and Biology

Components Lecture: 3.00 / Laboratory: 1.50

Requisites Prerequisites: BLG 567
Equivalencies

Attributes Case Studies, Research Project
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BLG 402

Course ID 004673

Short Title Limnology

Long Title Limnology

Long Descr Clean fresh water is of central importance to the welfare of the Canadian natural environment, human health and economy. Limnology is the study of biological, physical and geochemical properties of fresh water bodies, e.g., lakes, rivers, and wetlands. This introductory course will provide an array of topics that will, by the multidisciplinary nature of limnology, call upon students' knowledge of biology, chemistry and physics and place them within the context of aquatic science.

Academic Org Chemistry and Biology

Components Lecture: 3.00 / Laboratory: 1.50

Requisites Prerequisites: BLG 143 and BLG 144 and BLG 567 and (MTH 130 or MTH 131)
Equivalencies

Attributes Case Studies
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BLG 408

Course ID 023245

Short Title Viruses

Long Title Viruses

Long Descr This course will begin with a short history of virology, then move to an overview of virus replication strategies, with sample viruses from each of the Baltimore classification categories. Prions as well as other unusual infectious elements will also be introduced. The course will emphasize viruses for which Public Health Canada recommends immunization, and end with viruses for which there is no cure.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisites: BLG 143 and (CHY 261 or BCH 261)
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BLG 409

Course ID 023246

Short Title Biometry

Long Title Biometry

Long Descr This course will cover commonly used statistical analyses of biological data, working with data structures familiar and relevant to Biology majors. The course will focus on experimental design, training students to set up experiments with a priori consideration of statistical analysis. Specific topics will include probability, distribution analysis, measures of central tendency, confidence intervals, hypothesis testing, regression and correlation analyses, multiple regression models, chi-square tests, t-tests, analysis of variance (ANOVA) models, power analyses.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisite: BLG 144 and MTH 231
Equivalencies

Attributes Lab Work, Research Project
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BLG 411

Course ID	023927
Short Title	Cell Biology II
Long Title	Cell Biology II
Long Descr	This course will focus on cell function and behaviour. The course will cover mechanisms of cell-cell adhesion and cell adhesion to the extracellular matrix, mechanisms of cellular communication and signal transduction, cell motility and morphology, regulation of the cell cycle, apoptosis and an introduction to cell differentiation. The laboratory component will complement basic cell structure concepts.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00 / Laboratory: 1.50
Requisites	Prerequisites: BLG 311
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

BLG 481

Course ID 000409

Short Title Biology and Chemistry Project

Long Title Biology and Chemistry Project Laboratory

Long Descr This course will offer students the opportunity to undertake two laboratory projects (12-12 laboratory hours). The student will also be expected to research the theory required to understand the experimental work and the methodology being used; to suggest or to adapt appropriate experimental procedures; to make an oral presentation of the work and to write a report(s) in a format appropriate to the subject matter investigated. This course will not be available to students registered in CHY 40A/B. See teaching department for consent criteria.

Academic Org Chemistry and Biology

Components Laboratory: 3.00

Requisites
Equivalencies

Attributes Lab Work, Research Project
Dept Consent Department Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BLG 508

Course ID 024322

Short Title Conservation Biology

Long Title Conservation Biology

Long Descr The conservation of biodiversity and relationships with human society will be discussed. Lectures would emphasize issues germane to Canada's ecosystems or geographic regions. Students will develop understanding of conversation genetic theory, will review the ecology of small populations, and consider various aspects related to extinctions and biodiversity. Basic tools of conservation biology such as computer modeling, conservation genetics, and metapopulation processes will be introduced in the context of particular ecosystem, species, or situations.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisite: BLG 230 and BLG 316 and BLG 567
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N

Total Completions 1
Course Topics

BLG 567

Course ID 010171

Short Title Ecology

Long Title Ecology

Long Descr An introduction to fundamental ecological principles and illustration of how these are applied to current environmental problems at the level of organisms, populations, communities and ecosystems. Topics to include the nature of ecological experiments; population dynamics; population harvesting; ecological processes structuring biological communities in space and time; energy and nutrient flows in ecosystems, the relationship between ecological goods and services.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisites: BLG 144 and CHY 113
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BLG 578

Course ID 010183

Short Title Pharmacology

Long Title Pharmacology

Long Descr The pharmacological and biochemical basis of drug absorption, distribution, metabolism, biotransformation, toxicity and susceptibility. Topics include physiological effects, modes of delivery, chemical carcinogenesis and mechanism of action and cellular resistance to antibacterial and anticancer drugs.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisites: BLG 311 and BCH 361
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BLG 586

Course ID 027250

Short Title Molecular Diagnostics

Long Title Molecular Diagnostics

Long Descr This course will introduce the fundamentals and application of molecular diagnostic methods, which involves the
process of identifying a disease by studying molecules, such as proteins, DNA, and RNA, in cells, tissues, or body
fluids. Experimental design, execution, and ethical considerations in medical diagnostics will be explored.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisites: BCH261
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BLG 599

Course ID 024748

Short Title Bio Facts in Pop Media Sci-Fi

Long Title Biology Facts in Pop Media Sci-Fiction

Long Descr This course is an exploration of the real science and technology behind the science fiction portrayed in popular media (movies, television, internet and print). Topics may include: cloning of cells and organisms; DNA sequencing and genomics; forensics techniques used in real labs; how to analyze and understand statistics in health related news articles; the chemistry and physiology behind health foods and fads; the pros and cons of genetically modified organisms (GMOs); etc. Students will be able to choose and direct their studies of specific movies, episodes and articles.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Not available to Engineering students, nor Faculty of Science students (with the exception of Computer Science, Financial Mathematics and Mathematics and its Applications).

Equivalencies

Attributes Research Project, Upper Level Liberal Studies
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BLG 600

Course ID 010283

Short Title Physiology

Long Title Physiology

Long Descr A systematic approach to the function of the main physiological systems and their integration and interaction in the human body. Functions of the integumentary, immune, circulatory, skeletal, muscular, respiratory, nervous, endocrine, gastrointestinal, urinary and reproductive systems. The physiological consequences of disease, aging, exercise, and pregnancy are also considered.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisites: BLG 311; Antirequisite: BLG 601
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1

Course Topics

BLG 601

Course ID	024321
Short Title	Physiology
Long Title	Physiology
Long Descr	A course for engineers on the systematic approach to the function of the main physiological systems and their integration and interaction in the human body. Functions of the integumentary, immune, circulatory, skeletal, muscular, respiratory, nervous, endocrine, gastrointestinal, urinary and reproductive systems. The physiological consequences of disease, aging, exercise, and pregnancy are also considered.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00
Requisites	Prerequisites: BLG 143 and (CEN 100 or PCS 229); Antirequisite: BLG 600
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

BLG 605

Course ID 026093

Short Title Science and Gov Policy Dev

Long Title Science and Government Policy Development

Long Descr All levels of government in Canada rely on a number of sources of scientific information in order to create, modify or update public policy. This course will examine the processes by which government seeks, collects and/or commissions scientific information and how government policy is influenced by scientific information. This course will examine case studies of specific government policies that shape and/or are shaped by scientific information and data collection.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisite: BLG 151 or BLG 311 or BLG 230 or CHY 142
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BLG 606

Course ID 026094

Short Title Intro Clinical Research Trials

Long Title Intro to Clinical Research and Trials

Long Descr Clinical trials are critical to demonstrate drug safety and efficacy. This course will examine the process of conducting clinical trials, including considerations for recruitment of patients, drafting of research protocols and informed consent forms, regulatory considerations, financial disclosure, and investigator recruitment. This course will also examine stakeholder roles and responsibilities including that of institutional review boards, investigators and regulatory bodies, including a discussion of specific case studies and examination of primary scientific data.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisite: BLG 151 or BLG 311 or BLG 230 or CHY 142
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1

Course Topics

BLG 607

Course ID	026095
Short Title	Intellectual Property Science
Long Title	Intellectual Property in Science
Long Descr	Scientific research and development in academia and industry depends on intellectual property laws to protect discoveries and to allow commercialization of innovative products and services. This course will examine Canadian and international intellectual property legislation related to variety of scientific research and development industries. This course will also make use of case studies to explore how scientific innovation is impacted by intellectual property legislation.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00
Requisites	Prerequisite: BLG 151 or BLG 311 or BLG 230 or CHY 142
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

BLG 610

Course ID 025628

Short Title Data Science for Biology

Long Title Data Science for Biology

Long Descr Data science has been described as the fourth scientific paradigm because it integrates the methods of experimentation, theory, and simulation to arrive at deeper insights. In this course, you'll learn how to apply the tools of data science to biological data (from cells to individuals, populations, communities, and ecosystems). The course will focus on learning data science through examples using biological data.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisites: MTH 380
Equivalencies

Attributes Case Studies
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BLG 630

Course ID 025629

Short Title Population Biology

Long Title Population Biology

Long Descr This course will provide in-depth understanding of applied population biology. Topics include population growth and regulation, demography, interspecific interactions, evolution of life histories, management of threatened species and control of pest organisms using ecological and evolutionary perspectives. Active learning exercises emphasize applied field skills, experimental design, and computer simulation needed by environmental scientists. In-class lectures and activities will be supplemented by field trips.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisites: BLG 230 and (BLG 315 or BLG 567)
Equivalencies

Attributes Field Studies
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BLG 655

Course ID	027293
Short Title	Viruses Among Us
Long Title	Viruses Among Us
Long Descr	This course is designed for students with a minimum background in biology or medicine who want to understand viruses, historical perspectives and epidemiological accounts of viral diseases, and the threats of new pandemics. Topics will include viral biology, pathogenesis, epidemiology, vaccinations, and the societal impact of viral pandemics. Students will learn to critically evaluate claims in the news about viruses and challenging policy decisions in pandemics. Students will have an opportunity to effectively communicate information about viruses to the public through current forms of media.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00
Requisites	Antirequisite: BLG 408
Equivalencies	
Attributes	Upper Level Liberal Studies
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

BLG 667

Course ID 025248

Short Title Disease Ecology

Long Title Disease Ecology

Long Descr This course will examine the adaptations of many organisms (e.g. viruses, bacteria, fungi, protists, helminths, and parasitic arthropods) to a parasitic way of life, parasite population dynamics, and host-parasite interactions in an ecological and evolutionary context. Topics discussed include strategies for establishment, persistence, reproduction, and transmission, parasite origins and life histories, epidemiology and disease modeling, ecological implications of diseases, host-parasite co-evolution, and emerging infectious diseases.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisites: BLG 316 and BLG 567
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BLG 678

Course ID 010153

Short Title Current Topics in Biology

Long Title Current Topics in Biology

Long Descr Recent developments and topics of current interest in biology and their applications will be included. A variety of instructional modes will be used e.g. lecture, seminar, guest speakers, student presentations, demonstration and practice.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisites: BCH 361 and BLG 307
Equivalencies

Attributes Research Project
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit Y
Total Completions 3
Course Topics 1. Spatial Data Analysis and Ecoinformatics
2. Biological Processes at Macro/Micro Scales
3. The Human Genome Project
4. Causative Agents in Pandemics

5. The COVID-19 Pandemic

BLG 699

Course ID	024749
Short Title	Social Factors in Drug Dev
Long Title	Social Factors in Drug Development
Long Descr	Once a drug has been discovered, there are many factors that influence whether it is marketed. This course will explore the societal issues that affect pharmaceutical and biotech companies as they develop new compounds. After an introduction to the Canadian regulatory process, students will discuss topics such as laboratory animal welfare, ethics in clinical research, drug reimbursement and other pressures drug companies face to provide a drug or take it off the market.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00
Requisites	Not available to Engineering students, nor Faculty of Science students (with the exception of Computer Science, Financial Mathematics and Mathematics and its Applications); Antirequisites: BLG 143, BLG 144
Equivalencies	
Attributes	Upper Level Liberal Studies
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

BLG 700

Course ID	010194
Short Title	Anatomy
Long Title	Anatomy
Long Descr	This course takes a systematic approach to the structure of the human body at the gross and microscopic levels. Areas of focus include tissues, the integumentary, skeletal, muscular and nervous systems, and embryology.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00
Requisites	Prerequisites: BLG 143 and BLG 144; Antirequisite: BLG 701
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

BLG 701

Course ID	003249
Short Title	Anatomy
Long Title	Anatomy
Long Descr	A course for engineers that takes a systematic approach to the structure of the human body at the gross and microscopic levels. Areas of focus include tissues, the integumentary, skeletal, muscular and nervous systems, and embryology.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00
Requisites	Prerequisites: BLG 143 and (CEN 100 or PCS 229); Antirequisite: BLG 700
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

BLG 702

Course ID 023928

Short Title Genomics and its Applications

Long Title Genomics and its Applications

Long Descr The relationship between the structure and function of a gene in both prokaryotes and eukaryotes; contents of various genomes, identification and implications; review of the Human Genome project; tools used in discovering and identifying sequences in a particular genome; analysis of gene expression.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisites: BLG 307 and BLG 400
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BLG 707

Course ID 024326

Short Title Entomology

Long Title Entomology

Long Descr A lecture course designed to introduce insect structure, physiology, biochemistry, development, systematics, evolution and ecology. The course stresses interrelationships amongst diverse ecological communities and integrated pest control including life-histories and insect-plant relations. Interactions with the agricultural, forestry, and soil biomes will be examined.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisites: BLG 143 and BLG 144 and BLG 316
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BLG 720

Course ID 026394

Short Title Urban Water Field Biology

Long Title Urban Field Biology - Water Ecosystems

Long Descr A two-week field course (late August - early September) at selected field locations in Toronto area accessible by transit. Students will: learn about urban water ecosystems; develop field biology skills (sampling methods and identification); improve ability to accurately and reflectively characterize field observations; collect data for their own scientific experiment (individually or in small groups); and present their findings during in-class workshops or seminars. Additional fees may apply. Details to be provided by Department. See teaching department for consent criteria.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites
Equivalencies

Attributes
Dept Consent Department Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BLG 721

Course ID 026393

Short Title Inter-University Field Course

Long Title Inter-University Field Course

Long Descr A two-week field course offered between May and August by an Ontario university (to various locations) as part of the Ontario Universities Program in Field Biology (OUPFB). The selection of field course modules are announced in January. For registration information and additional fees information consult the Chemistry and Biology Departmental website; fees from $350-5000 will be applied for field trip costs. See teaching department for consent criteria.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites
Equivalencies

Attributes
Dept Consent Department Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BLG 785

Course ID	010274
Short Title	Developmental Biology
Long Title	Developmental Biology
Long Descr	An introduction to the study of development of plants and animals both at the organism and molecular level. Topics include sequential morphological changes and gene expression during development, sexual maturation and the aging process.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00
Requisites	Prerequisites: BLG 307 and BLG 311 and BLG 400 and BCH 261
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

BLG 788

Course ID 010254

Short Title Topics in Biotechnology

Long Title Current Topics in Biotechnology

Long Descr This course will cover the process of translating knowledge to produce commercial products that address unmet needs, with a focus on biology, chemistry, and medical sciences. Topics will include the genetic engineering of cells, plants, and animals, intellectual property, target validation, screening, pre-clinical and clinical development, entrepreneurship, and commercialization.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisite: BLG 307
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit Y
Total Completions 2
Course Topics 1. Drug Discovery and Development
2. Solving Biomedical Needs

BLG 800

Course ID 010288

Short Title Genomics and Proteomics

Long Title Genomics and Proteomics

Long Descr An introduction to genomics and proteomics; relationship between structure and function of a gene; tools used in discovering and identifying sequences in a particular genome; an overview of protein structure and function, tools for structural determination, analysis of protein-protein interactions, introduction to the high throughput identification and quantification of protein expression; review of the Human Genome project; application of genomics and proteomics to drug design.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisites: BCH 261
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BLG 802

Course ID	024323
Short Title	Plant Diversity
Long Title	Plant Diversity
Long Descr	Evolution has enabled plants to transform from aquatic organisms in to terrestrial life forms capable of performing the critical functions of nutrition, respiration, and reproduction in diverse environments. This course examines the different ways that plants become suited to their environments. These include adaptations in flowering and non-flowering plants, methods of obtaining food, pollination, seed dispersal, support, food and water storage, protection from herbivores, and adjustments to climatic changes.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00
Requisites	Prerequisite: BLG 230 and BLG 567
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

BLG 803

Course ID 024324

Short Title Ecosystem Processes

Long Title Ecosystem Processes

Long Descr This course will delve into some of the critical ecosystem-level functions involving elemental and materials (e.g. water) cycles in the context of a variety of ecosystem types. The course will cover energy flow through these ecosystems, including organic matter production by photo and chemo autotrophs, and heterotrophic processing. The course will link elemental cycles with energy flow to help students better understand the interactions among C, N, P, S, and Fe cycles in ecosystems, and how cycling of these elements in necessary for maintaining the integrity of ecosystems. The course will build on system-based modeling introduced in Ecology (BLG 567), enabling students to build predictive models that explore ecosystem-wide impacts of perturbations to elemental or hydrologic cycles.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisite: BLG 567
Equivalencies

Attributes Case Studies
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BLG 804

Course ID 024325

Short Title Water Quality and Envir Mgt.

Long Title Water Quality and Environmental Management

Long Descr Protecting global water resources is one of the key problems facing the 21st century and this course will examine the management of this invaluable resource. From non-point source urban and agriculture runoff to industrial and municipal effluent to resource extraction from source to be sold elsewhere, the problems of maintaining a sustainable water supply will be examined and solutions for implementation will be assessed. Floods, droughts, water quality, water-ecosystem and soil-water-climate interactions, and the sustainability of water resources are important issues in water resources management and will be emphasized in this course.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisite: BLG 151
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code

GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BLG 805

Course ID 026096

Short Title Behavioural Ecology

Long Title Behavioural Ecology

Long Descr This course will explore some of behaviours exhibited by organisms (including plants, but focusing on animals) in order to meet their basic needs, such as acquiring nutrition, avoiding danger, and reproducing. We will discuss how and why these behaviours occur, investigating ecological, evolutionary, and mechanistic aspects. Topics covered will include neurobiological pathways, behavioural genetics, chemical ecology, learning, game theory, co-evolution, and social behaviours.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisites: BLG 316 and BLG 567
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BLG 806

Course ID 026103

Short Title Tropical Field Ecology

Long Title Tropical Field Ecology

Long Descr The course focuses on the extraordinary diversity of tropical ecosystems through multi-day excursions to places such as rivers, pristine tropical broad leaf rainforest, and the Caribbean Ocean. Students will have the opportunity to conduct research projects within a diversity of local ecological habitats. See teaching department for consent criteria.

Academic Org Chemistry and Biology

Components Laboratory: 5.00 / Tutorial: 1.00

Requisites
Equivalencies

Attributes
Dept Consent Department Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BLG 810

Course ID 026104

Short Title Adv Techniques Plant Biology

Long Title Advanced Techniques in Plant Biology

Long Descr A comprehensive study of plant biology applications and techniques as they relate to applied botany. The topics covered in this course focus on methods associated with plant breeding and may include seed technology, genetic marker assisted breeding, tissue culture, chemo-prospecting, propagation techniques, and chemical extraction techniques.

Academic Org Chemistry and Biology

Components Lecture: 3.00 / Laboratory: 3.00

Requisites Prerequisites: BLG 230 and BLG 307 and BLG 400
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BLG 850

Course ID 026556

Short Title What is Cancer?

Long Title What is Cancer?

Long Descr Cancer is the most prevalent disease in contemporary world. The basic biology of cancer as well as relevant clinical and therapeutic aspects of the disease will be covered. This knowledge will be then integrated with current public health issues in cancer prevention and treatment. Students will learn how to critically evaluate cancer claims in the news and explore common myths about cancer. Students will also have an opportunity to effectively communicate information about cancer to general public through current forms of media. This course is designed for non-science majors and as such does not require any university level science courses as prerequisites.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Not available to Biology, Biomedical Sciences, Chemistry, Contemporary Science, and Medical Physics students; Antirequisite: BMS 850

Equivalencies

Attributes Upper Level Liberal Studies
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BLG 856

Course ID 010241

Short Title Immunology

Long Title Immunology

Long Descr The organization and structure of the immune system including an introduction to humoral cellular immunity and immunological techniques. The molecular and cellular basis of immunity, including histocompatibility antigens and the basis of autoimmune diseases will also be covered.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisites: BLG 411 and BCH 261

Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BLG 888

Course ID	010227
Short Title	Molecular Biology Laboratory
Long Title	Molecular Biology Laboratory
Long Descr	This lab course will cover experiments on recombinant DNA technology. The lab experience includes experiments for DNA isolation, cloning, and restriction endonuclease digestion. Genotypic characterization will also be investigated using PCR methodology. Protein characterization will include isolation, SDS-polyacrylamide gel electrophoresis, and detection using Western blot analysis with monoclonal antibodies.
Academic Org	Chemistry and Biology
Components	Laboratory: 3.00 / Tutorial: 1.00
Requisites	Prerequisite: BLG 307
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

BMS 150

Course ID 024938

Short Title Intro to the Human Genome

Long Title Introduction to the Human Genome

Long Descr This course for non-science majors aims to explore our current understanding of the principles of genetics as applied to the human genome. The human genome has been fully sequenced and individuals are now choosing elective surgery based on knowledge of their genetic make-up. Students will be exposed to current ideas of the connection between our genes, health and illnesses and to the similarities and differences in genomes and gene expression among individuals and populations.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Not available to Faculty of Engineering and Architectural Science, Biology (all options), Biomedical Sciences (all options), Chemistry (all options), nor Medical Physics (all options).

Equivalencies

Attributes Lower Level Liberal Studies
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BMS 280

Course ID 024755

Short Title Biomedical Sci Orientation II

Long Title Biomedical Science Orientation II

Long Descr This course focuses on topics designed to introduce the careers paths available to graduates of the program. It will also review requirements needed to enter many professional schools and opportunities available in non-traditional areas. The lectures will be complemented with speakers who will speak about their educational path and how they arrived at their career. All students in Biomedical Sciences students must enroll in BMS 280 in their third semester of studies. This course is graded on a pass/fail basis.

Academic Org Chemistry and Biology

Components Lecture: 1.00

Requisites
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Pass/Fail
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N

Total Completions 1
Course Topics

BMS 451

Course ID	024758
Short Title	Medical Microbiology
Long Title	Medical Microbiology
Long Descr	This course will deal with the study of microorganisms including bacteria, viruses, fungi and parasites which are of medical importance and are capable of causing diseases in human or animals. It includes the laboratory diagnosis of human and animal infections and the role of the laboratory in both the management of infectious diseases and the elucidation of the epidemiology of infections.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00
Requisites	Prerequisites: BLG 151
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

BMS 500

Course ID 024761

Short Title Human Genetics

Long Title Human Genetics

Long Descr This course will include current aspects of human and molecular genetics including: chromosome structure and function, inheritance of mutations and disease, the human genome and disease gene mapping, cancer genetics, mouse disease models and gene based diagnostics and therapies. It will examine approaches used in genetic screening, genetic counselling and genetic therapy.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisites: BCH 261 and BLG 400
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BMS 600

Course ID 027251

Short Title Human Anatomy and Physiology I

Long Title Human Anatomy and Physiology I

Long Descr The first of two courses designed to introduce the processes and systems of human anatomy and physiology. Topics
covered in this class include: Principles of homeostasis; anatomical terminology and tissue organization; skin and
integumentary system; skeletal system and joints; muscular system and function; nervous system cells and tissues;
nerve signalling; central, peripheral, and autonomic nervous systems; special sensory systems; and endocrine
system.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisite: BLG 311; Antirequisites: BLG 600, BLG 601, BLG 700, BLG 701
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BMS 605

Course ID	024759
Short Title	Advanced Physiology
Long Title	Advanced Physiology
Long Descr	The regulation of physiological processes by hormones and other signalling molecules in chordates will be discussed. An integrated genes-to-environment approach is used to examine aspects of hormonal evolution, physiological information flow, behaviour and neuroendocrinology, and xenobiotic endocrine disruptors.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00
Requisites	Prerequisites: BCH 261 and BLG 411 and BLG 600
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

BMS 607

Course ID 024756

Short Title Mol Genetics and Epigenetics

Long Title Molecular Genetics and Epigenetics

Long Descr A discussion on current aspects of molecular genetics including: chromosome structure and function, inheritance of mutations and disease, the human genome and disease gene mapping. This course will also cover the study of heritable changes in gene expression that occur without a change in DNA sequence, or epigenetics. This course will address the basic principles of epigenetics, the role of epigenetic mechanisms in normal development and human disease with emphasis on the role of chromatin structure.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisites: BLG 307, BLG 400
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BMS 650

Course ID 024750

Short Title Experimental Design

Long Title Experimental Design

Long Descr This course will be an advanced discussion of tools and techniques that form the basis for research discovery in genetics, biochemistry and molecular cell biology. Emphasis will be placed in key elements of experimental design including the importance of positive and negative controls, statistical analysis, experimental complementation and understanding limitations. A discussion of bioethical considerations in experimental design will also be included.

Academic Org Chemistry and Biology

Components Lecture: 3.00 / Tutorial: 2.00

Requisites Prerequisites: BLG 307, BLG 400, BLG 311
Equivalencies

Attributes Case Studies
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BMS 700

Course ID	027252
Short Title	Human Anatomy Physiology II
Long Title	Human Anatomy and Physiology II
Long Descr	The second of two courses designed to introduce the processes and systems of human anatomy and physiology. Topics covered in this class include: cardiovascular system; lymphatic/immune system; respiratory system; digestive system; metabolism and nutrition; urinary system and electrolyte balance; reproductive system including physiology of pregnancy and development; and growth and aging.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00
Requisites	Prerequisites: BMS 600; Antirequisites: BLG 601 and BLG 701 and BLG 600 and BLG 700
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

BMS 750

Course ID 024751

Short Title Systems Biology

Long Title Systems Biology

Long Descr This course focuses the integration of complex biological data sets and non-reductionist approaches to studying living organisms. This course will begin by an examination of systems theory, stochasticity in biological systems, emergent behaviours, the advent of high-throughput biological experimental techniques and the use of modeling to understand biological processes. The course will also examine epigenetic systems, lipidomics, metabolomics, synthetic biology, integrative cellular signaling networks and computational modeling of cellular systems. The laboratories will complement the lectures.

Academic Org Chemistry and Biology

Components Lecture: 3.00 / Laboratory: 1.50

Requisites Prerequisites: BLG 307
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BMS 760

Course ID 024752

Short Title Critical Thinking in BMS

Long Title Critical Thinking in Biomedical Sciences

Long Descr The lecture component will emphasize the development and application of strategies and tools to analyse, interpret and critically evaluate knowledge in biomedical sciences through the use of primary literature. Students will learn to recognize outstanding questions, speculative arguments, ambiguities and/or flaws, and logically suggest the use of strategies that might resolve identified issues. The course will also focus on the ability to communicate in written and oral form. Finally, students will learn about and implement bioethical considerations in their arguments. The tutorial component will help students learn to execute critical thinking and communication concepts.

Academic Org Chemistry and Biology

Components Lecture: 3.00 / Tutorial: 2.00

Requisites Prerequisite: BMS 650
Equivalencies

Attributes Case Studies
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0

Repeat for Credit N
Total Completions 1
Course Topics

BMS 770

Course ID 024762

Short Title Medical Epidemiology

Long Title Medical Epidemiology

Long Descr This course will present an overview of epidemiology - uses, methods, and data sources. It will include an overview of types of human genetic variation, approaches to gene discovery vs. gene characterization. It will also cover the epidemiology behind flu vaccine development and the spread of infectious diseases.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisite: MTH 380, BLG 144
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BMS 850

Course ID	024753
Short Title	Cancer Biology
Long Title	Cancer Biology
Long Descr	Current concepts and knowledge about cancer will be covered with a focus on the cellular and molecular mechanisms underlying cancer development and progression. Specific topics covered may include the eukaryotic cell cycle, the history of cancer, oncogenes, tumour suppressors, and cancer- causing viruses. Students will analyze and discuss primary research papers that highlight fundamental aspects of cancer.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00 / Laboratory: 1.50
Requisites	Prerequisites: BLG 307 and BLG 411
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

BMS 857

Course ID	024757
Short Title	Advanced Immunology
Long Title	Advanced Immunology
Long Descr	This course will provide an overview of immunopathology, transplantation, autoimmunity and tumour immunology. It will include an introduction to the genetics and cellular pathogenesis of autoimmune diseases such as type I diabetes and multiple sclerosis. Also included will be the pathogenesis and the treatment of immune-related conditions such as Crohn's Disease and HIV as well as transplantation and graft rejection.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00
Requisites	Prerequisite: BLG 856
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

BMS 858

Course ID	024760
Short Title	Infection and Immunity
Long Title	Infection and Immunity
Long Descr	The primary focus of this course is the interactions between mammalian-specific bacterial, fungal and protozoan pathogens and their hosts. The course will examine molecular mechanisms underlying pathogen-host recognition, pathogen invasion of host cells and hijacking of host cell signalling. The molecular basis of the host immune response to pathogens and how pathogens interact with, modify and/or evade the immune system will also be covered. The course will conclude with a review of appropriate versus inappropriate host immune responses to infectious and non-infectious agents and how these responses contribute to the outcomes of infectious diseases and several infection-related autoimmune.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00
Requisites	Prerequisites: BLG 151, BLG 856
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

BMS 860

Course ID 024754

Short Title Stem Cell Biology

Long Title Stem Cell Biology

Long Descr This course will examine the molecular and cell biology of stem cells and their importance in development and maintenance of adult tissues like blood and skin. Additionally, the course will discuss topics such as pluripotency, a discussion and comparison between embryonic and adult stem cells, induced pluripotency and the ethical issues related to stem cell use in medicine.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisites: BCH 261, BLG 307, BLG 411 and (BLG 600 or BMS 600)
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BMS 865

Course ID 024763

Short Title Model Organisms

Long Title Model Organisms

Long Descr An introduction and discussion of the various model organisms employed in the life sciences from the unicellular organisms like E. coli and Baker's yeast to simple and complex multicellular organisms like Drosophila, C. elegans, mouse and Arabidopsis. The course will discuss major discoveries made with these organisms, their advantages and disadvantages and maintain a historical perspective on the use of these organisms.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisites: BLG 151 and BLG 311 and BLG 400
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

BMS 870

Course ID 024764

Short Title Neurobiology

Long Title Neurobiology

Long Descr This course will examine the development, anatomy and function of the nervous systems in various organisms with emphasis on humans and its relationship to behaviour and disease. Neuronal structure and function including synapses and neurotransmitters will be discussed. Sensory perception and motor responses will be examined. The current understanding of higher order functions of cognition, learning, memory and communication will be explored.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisites: BLG 411 and (BLG 600 or BMS 600)
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CHY 40A

Course ID 020072

Short Title Research Project-Thesis-A

Long Title Research Project-Thesis-A

Long Descr A laboratory research project supervised by a faculty member. An oral presentation of results and a thesis are required. Enrolment in this course may be restricted by the number of available projects. See teaching department for consent criteria.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites
Equivalencies

Attributes Lab Work, Research Project
Dept Consent Department Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Multi-Term Course: Not Graded
Hegis Code
GPA Weight 0.00/0.00
Billing Units 1.0
Course Count 0.0
Repeat for Credit N
Total Completions 1
Course Topics

CHY 40B

Course ID	020073
Short Title	Research Project-Thesis-B
Long Title	Research Project-Thesis-B
Long Descr	A laboratory research project supervised by a faculty member. An oral presentation of results and a thesis are required. Enrolment in this course may be restricted by the number of available projects.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00
Requisites	Prerequisite: CHY 40A
Equivalencies	CHY40B/CHY40
Attributes	Lab Work, Research Project
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	2.00/2.00
Billing Units	1.0
Course Count	2.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CHY 102

Course ID	003190
Short Title	General Chemistry
Long Title	General Chemistry
Long Descr	This course is intended for Engineering students. This course deals with stoichiometry, gases, liquids and solids, chemical equilibria, thermodynamics, kinetics, nuclear chemistry and electrochemistry. The treatment of these topics will emphasize problem solving and calculation.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00 / Laboratory: 1.00
Requisites	Antirequisites: CHY 103 or CHY 104 or CHY 123 or CHY 182 or CHY 183
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CHY 102E

Course ID 003190

Short Title General Chemistry

Long Title General Chemistry

Long Descr This course is intended for Engineering students. This course deals with stoichiometry, gases, liquids and solids, chemical equilibria, thermodynamics, kinetics, nuclear chemistry and electrochemistry. The treatment of these topics will emphasize problem solving and calculation.

Academic Org Chemistry and Biology

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Antirequisites: CHY 103 or CHY 104 or CHY 123 or CHY 182 or CHY 183
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CHY 103

Course ID 000564

Short Title General Chemistry I

Long Title General Chemistry I

Long Descr This foundation course begins with an introduction to types of chemical compounds, chemical reactions and stoichiometry. Subsequent topics include the investigation of the states of matter (primarily liquids and gases), solutions and colligative properties, chemical equilibrium, acids and bases, and thermochemistry. This course acts as the first half of a full year general chemistry sequence and is a precursor to CHY 113 General Chemistry II.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Antirequisite: CHY 102, CHY 104, CHY 123, CHY 182, CHY 183
Equivalencies CHY103/CKCH106

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CHY 104

Course ID 001489

Short Title General Chemistry

Long Title General Chemistry

Long Descr This course is intended for Occupational and Public Health students. This course deals with stoichiometry, solution composition, redox reactions, kinetics, equilibrium including aqueous equilibria, acid, bases and salts, thermochemistry, chemical bonding and an introduction to organic chemistry (study of aliphatic and aromatic hydrocarbons).

Academic Org Chemistry and Biology

Components Lecture: 3.00 / Tutorial: 1.50

Requisites Antirequisites: CHY 102, CHY 103, CHY 123, CHY 182, CHY 183
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CHY 113

Course ID 001225

Short Title General Chemistry II

Long Title General Chemistry II

Long Descr This course builds on the topics introduced in CHY 103 General Chemistry I. Emphasis is placed on modern atomic theory, including atomic structure, orbitals, shapes of molecules, bonding theories, intermolecular forces and periodicity. Additional topics include thermodynamics, kinetics, electrochemistry, solids and phase changes. This course acts as the second half of a full year general chemistry sequence.

Academic Org Chemistry and Biology

Components Lecture: 3.00 / Laboratory: 3.00

Requisites Prerequisite: CHY 103; Antirequisites: CHY 123 and CHY 211
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CHY 123

Course ID 022862

Short Title General Chemistry

Long Title General Chemistry

Long Descr This course is intended for Food and Nutrition students. This course includes the following topics: atomic structure and periodicity, bonding and structure, stoichiometry, solutions and their properties, equilibrium, acids and bases, and acid-base equilibria. The treatment of the above topics will emphasize understanding of chemical principles and their application to problem solving and calculations. The laboratory is an introduction to laboratory techniques, mass-volume relationships, acid-base titrations, analytical techniques and colorimetry.

Academic Org Chemistry and Biology

Components Lecture: 3.00 / Laboratory: 1.50

Requisites Antirequisites: CHY 102, CHY 103, CHY 104, CHY 113, CHY 211, CHY 182, CHY 183
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CHY 142

Course ID 003417

Short Title Organic Chemistry I

Long Title Organic Chemistry I

Long Descr This is an introductory course based on the mechanistic approach to the study of organic reactions, and includes functionality, IUPAC nomenclature, structural and steroisomerism, oxidation and reduction, nucleophilic additions, nucleophilic substitutions, eliminations, electrophilic additions of aliphatic compounds. The laboratory introduces techniques such as melting point, recrystallization, extraction, and distillation. Also included is the synthesis, isolation and purification of organic compounds.

Academic Org Chemistry and Biology

Components Lecture: 3.00 / Laboratory: 3.00

Requisites Prerequisites: CHY 113; Antirequisites: CHY 152, CHY 200, CHY 224
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1

Course Topics

CHY 152

Course ID	004913
Short Title	Introductory Organic Chemistry
Long Title	Introductory Organic Chemistry
Long Descr	This course is intended for Occupational and Public Health students. An introductory organic chemistry course which includes the following topics: bonding, nomenclature, main functional groups, properties, reactions and characteristics of organic compounds.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00
Requisites	Prerequisite: CHY 104 or in Occ. Health and Safety 2 yr UG or OHS Degree Completion Pathway; Antirequisites: CHY 142, CHY 200, CHY 224
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CHY 182

Course ID 022350

Short Title Chem Apps to Living Systems

Long Title Chemistry Applications to Living Systems

Long Descr The emphasis of this course will be on understanding chemistry and the role it plays in everyday life, particularly to those who live in an urban environment. The course will endeavor to have a conceptual and contextual focus rather than a quantitative approach, relating chemistry to urban/environmental issues with particular reference to life in Toronto where possible. Topics could include water/sewage treatment, air pollution, energy sources, soil chemistry, foods, and industrial chemistry (polymer, petroleum, pharmaceutical, etc.) The curriculum could also include sections on street drugs, cosmetics, chemistry in the movies, and forensic chemistry. (Formerly SCI 182). (May not be used as a credit towards a science degree). CHY 182 is not available for credit to students who choose CHY 103 or CHY 113.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Not available to Engineering students, nor any option of Biology, Biomedical Sciences, Chemistry, or Medical Physics, nor to Nutrition and Food nor Occupational and Public Health students; Antirequisites: CHY 102, CHY 103, CHY 104, CHY 113, CHY 123

Equivalencies SCI 101 and SCI 182

Attributes Lower Level Liberal Studies
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CHY 183

Course ID 023895

Short Title Intro to Forensic Sciences

Long Title Introduction to Forensic Sciences

Long Descr The popularity of TV shows depicting the science of criminal investigations has impacted the way forensic science is viewed by the public and media. This course will provide non-science students with an introduction to the field of forensic science. Students will develop an appreciation of the critical methods of scientific investigation, reasoning, and communication. Topics will include techniques of chemical analysis, physical investigation, and the role of expert witnesses in crime scene investigations. (Formerly SCI 183).

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Antirequisites: BLG 143, CHY 102, CHY 103, CHY 104, CHY 123. Not available to Engineering students nor Faculty of Science students (with the exception of Computer Science, Financial Mathematics or Mathematics and its Applications students).

Equivalencies

Attributes Lower Level Liberal Studies
Dept Consent No Special Consent Required

Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CHY 200

Course ID 000896

Short Title Organic Chemistry

Long Title Organic Chemistry

Long Descr This course is intended for Food and Nutrition students. This is an introductory course which is based on the mechanistic approach to the study of organic reactions, and includes functionality, IUPAC nomenclature, structural and steroisomerism, oxidation and reduction, nucleophilic additions, nucleophilic substitutions, eliminations, electrophilic additions of aliphatic compounds. The laboratory introduces basic organic laboratory techniques such as melting point, recrystallization, extraction, and distillation. Also included is synthesis, isolation and purification of organic compounds.

Academic Org Chemistry and Biology

Components Lecture: 3.00 / Laboratory: 1.50

Requisites Prerequisite: CHY 123; Antirequisites: CHY 142, CHY 224, CHY 152
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CHY 203

Course ID 002155

Short Title Instrmntl Methods of Analysis

Long Title Instrumental Methods of Analysis

Long Descr This course is intended for Chemical Engineering students. Instrumentation for and applications of spectroscopic, chromatographic and electro-analytical analyses are discussed.

Academic Org Chemistry and Biology

Components Lecture: 2.00 / Laboratory: 1.50

Requisites Prerequisites: CHE 200, CHY 102, CHY 211, CPS 125, PCS 125, PCS 211, MTH 140, MTH 141, and MTH 240; Antirequisite: CHY 213

Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CHY 204

Course ID 003815

Short Title Biochemistry I

Long Title Biochemistry I

Long Descr This course is intended for Food and Nutrition students. This course deals with the structures, functions, chemistry and food applications of proteins, carbohydrates, lipids and nucleic acids. Also included is an introduction to enzymology (coenzymes, nomenclature and classifications of enzymes and enzymatic control of biochemical reactions). The laboratory provides introduction to basic techniques used in analytical biochemistry.

Academic Org Chemistry and Biology

Components Lecture: 3.00 / Laboratory: 1.50

Requisites Prerequisite: CHY 200; Antirequisite: BCH 261

Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CHY 205

Course ID 000483

Short Title Biochemistry II

Long Title Biochemistry II

Long Descr This course is intended for Food and Nutrition students. This course begins with an overview of the principles of catalysis and bioenergetics. This will be followed by an examination of intermediary metabolism of carbohydrates, fatty acids and amino acids with emphasis on the regulation of these processes. Topics include glycolysis, the citric acid cycle and oxidative phosphorylation. The course concludes with an introduction to information pathways including genes, chromosomes, DNA, RNA and protein synthesis.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisite: CHY 204; Antirequisite: BCH 261
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CHY 211

Course ID 004146

Short Title General Chemistry Laboratory

Long Title General Chemistry Laboratory

Long Descr This course is intended for Chemical Engineering students. Introduction to chemical laboratory that includes the following topics: mass - volume relationship; solution; dilution, and concentration; acid-base titration; hardness of water; solubility; reaction kinetics; colorimetry; determination of concentration of iron in a solution; concentration analysis of aspirin.

Academic Org Chemistry and Biology

Components Laboratory: 3.00

Requisites Prerequisite: CHY 102; Antirequisites: CHY 113, CHY 123
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CHY 213

Course ID	003250
Short Title	Analytical Chemistry I
Long Title	Analytical Chemistry I
Long Descr	This course is an introduction to quantitative chemical analysis. Lecture topics include approaches to chemical analysis, equilibrium calculations, buffer preparation and mechanism, titrations and their applications, statistical analysis of data and an introduction to instrumental methods. The laboratory portion of this course includes experiments that apply the above topics.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00 / Laboratory: 3.00
Requisites	Prerequisite: CHY 113; Antirequisite: CHY 203
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CHY 223

Course ID	001677
Short Title	Analytical Chemistry II
Long Title	Analytical Chemistry II
Long Descr	This course is a continuation of the analytical work from CHY 213, but concentrates on instrumental and analytical methods. The course introduces the student to the theory, instrumentation, and applications of: atomic and molecular spectroscopy, potentiometry (including ion-selective electrodes), and chromatography.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00 / Laboratory: 3.00
Requisites	Prerequisite: CHY 213
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CHY 224

Course ID	022870
Short Title	Organic Chemistry
Long Title	Organic Chemistry
Long Descr	This course is intended for Chemical Engineering students. This is an introduction to organic chemistry, covering bonding in organic molecules, nomenclature, isomerism and stereochemistry, organic acids and bases, and a mechanistic approach to understanding fundamental aliphatic and aromatic reactions. Industrial applications will be noted. The laboratory includes introduction to basic organic chemistry techniques.
Academic Org	Chemistry and Biology
Components	Lecture: 4.00 / Laboratory: 3.00
Requisites	Prerequisites: CHY 102 and CHY 211; Antirequisites: CHY 142, CHY 152, CHY 200
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	2.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CHY 242

Course ID 005957

Short Title Organic Chemistry II

Long Title Organic Chemistry II

Long Descr This course includes the mechanistic approach to the study of organic reactions and includes condensation reactions, aromatic chemistry and pericyclic reactions. Also included are spectroscopic methods of structure determination, organic synthesis and the use of organometallic reagents.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisite: CHY 142
Equivalencies CHY242/CHY272

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CHY 249

Course ID 024950

Short Title Structure and Bonding

Long Title Structure and Bonding

Long Descr This course examines the various theories of atomic structure and molecular bonding as well as their application in explaining the physical and chemical properties of atoms and molecules. Topics include Lewis theory, valence bond theory, symmetry and group theory, crystal field theory, donor-acceptor chemistry and molecular orbital theory of molecules and extended structures.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisites: CHY 113
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CHY 307

Course ID 024951

Short Title Chemistry Lab Research Project

Long Title Chemistry Laboratory Research Project

Long Descr A 12-week intensive laboratory research project supervised by a faculty member. The project topic for this course must be different from any laboratory research thesis project or directed studies topic and must be program-related. An oral or poster presentation of results and project report are required. Enrolment in this course may be restricted by the number of available projects. See teaching department for consent criteria.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites
Equivalencies

Attributes Research Project
Dept Consent Department Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CHY 310

Course ID 026561

Short Title Commercial Chemistry

Long Title Commercial Chemistry

Long Descr Aspects of chemistry that are related to commercial activities with specific focus on those relevant to the Canadian economy. These may include agriculture, the energy sector, mining and refining processes, the environment and intellectual property protection.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisite: BCH 261
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CHY 330

Course ID 000358

Short Title Atomic/Molecular Spectroscopy

Long Title Atomic and Molecular Spectroscopy

Long Descr A course that emphasizes the theory and the criteria required for the selection of instruments and procedures for analytical applications and the critical evaluation of data obtained from such methods. Topics include UV-VIS (atomic and molecular), IR and X-Ray spectroscopy, and GC-MS analysis.

Academic Org Chemistry and Biology

Components Lecture: 3.00 / Laboratory: 3.00

Requisites Prerequisites: CHY 223
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CHY 331

Course ID 003130

Short Title Basic Chromatography

Long Title Basic Chromatography

Long Descr This course deals with the basic principles of chromatographic separations from a fundamental, analytical viewpoint. Lecture topics include general theory and equations of chromatographic methods, gas chromatography, liquid chromatography, and ion-exchange methods. Laboratory experiments will provide a back up to the theory of GC and HPLC and will demonstrate the variety of chromatographic techniques available for routine use.

Academic Org Chemistry and Biology

Components Laboratory: 3.00 / Lecture: 2.00

Requisites Prerequisite: CHY 223
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CHY 339

Course ID 022871

Short Title Characteriz. Organic Compounds

Long Title Characterization of Organic Compounds

Long Descr The application of spectroscopic methods to structure determination. Topics include ultraviolet-visible spectroscopy, infrared spectroscopy, mass spectrometry, and nuclear magnetic resonance spectroscopy. Emphasis will be placed on the use of coupling patterns and coupling constants to gain insight into the chemical structure of compounds using NMR. The laboratory will require students to purify and characterize samples using the above spectroscopic methods.

Academic Org Chemistry and Biology

Components Lecture: 3.00 / Laboratory: 3.00

Requisites Prerequisites: CHY 242
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CHY 344

Course ID 005929

Short Title Inorganic Chemistry

Long Title Inorganic Chemistry

Long Descr Physical and chemical properties of the main group elements and inorganic compounds are related to their electronic structures; principles are exemplified by technologically important substances and reactions. Topics include symmetry, covalent and ionic bonding theories, a survey of solid state structures and a discussion of secondary chemical interactions. The laboratory will emphasize the preparation of various main group inorganic compounds by important techniques (including vacuum and inert atmosphere synthesis) and product characterization by standard spectroscopic methods.

Academic Org Chemistry and Biology

Components Lecture: 3.00 / Laboratory: 3.00

Requisites Prerequisite: CHY 113
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1

Course Topics

CHY 381

Course ID	001442
Short Title	Physical Chemistry I
Long Title	Physical Chemistry I
Long Descr	The three laws of thermodynamics; free energy and chemical equilibria; thermodynamics of solutions.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00 / Laboratory: 1.50
Requisites	Prerequisites: CHY 113 and MTH 231
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CHY 382

Course ID	000468
Short Title	Physical Chemistry II
Long Title	Physical Chemistry II
Long Descr	Topics included are: rates and mechanism of reactions; adsorption and heterogeneous catalysts. The laboratory consists of experiments dealing with thermochemistry; electrochemical measurements; properties of liquids and solutions; kinetics of reactions and surface phenomena.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00 / Laboratory: 1.50
Requisites	Prerequisites: CHY 113 and MTH 231
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CHY 399

Course ID	024952
Short Title	Property-Directed Integ. Lab
Long Title	Property-Directed Integrated Laboratory
Long Descr	This experimentally intensive course builds on the skills obtained in the second year program and is designed for third and fourth year students with interest in property-directed chemical research. Students will develop competencies in advanced synthetic techniques and instrumentation. These may include vacuum distillation, glovebox use, manipulating reactions under anhydrous inert conditions, microwave synthesis, column chromatography, UV-Vis, CV, NMR, and computational methods. Students cannot take CHY 40A/B and CHY 399 in the same term.
Academic Org	Chemistry and Biology
Components	Laboratory: 5.50 / Lecture: 0.50
Requisites	Prerequisite: CHY 242; Corequisite: CHY 339
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	2.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CHY 422

Course ID	024953
Short Title	Environmental Chemistry
Long Title	Environmental Chemistry
Long Descr	The course studies the major chemical processes occurring in the natural environment and the impacts of human activities on these processes. Topics include introduction of environment and its components, techniques for environmental sample collection and preparation; the sources, reactions, transport, fates of chemical species in atmosphere, water, and soil and their effects on environment, ecosystem and human health. The laboratory portion of this course includes experiments based on the above topics and allows students to have hands-on experience of collecting and analysis water, air and soil samples.
Academic Org	Chemistry and Biology
Components	Lecture: 2.00 / Laboratory: 1.00
Requisites	Prerequisites: CHY 223 and CHY 242
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CHY 423

Course ID 002726

Short Title Environmental Science

Long Title Environmental Science

Long Descr The course introduces basic scientific principles and concepts that form the knowledge base for understanding of the natural environment. It covers environmental components and their physical, chemical and biological interactions. Topics include human population, ecosystems, nutrient cycles, energy flow, chemical interactions and pathways of environmental pollutants in the atmosphere and water, air and water pollution prevention.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisites: BLG 144 and CHY 113 and CHY 142
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CHY 431

Course ID 001958

Short Title Applied Analytical Chemistry

Long Title Applied Analytical Chemistry

Long Descr Lectures will include aspects of chemical equilibria, in particular protonation equilibria; buffers, natural and synthetic phase separation equilibria; non-aqueous solvent systems; applications of pH control and complexation to extraction and chromatographic systems will be cited where appropriate. Experiments may represent: inorganic structural elucidation; analytical extraction techniques, including pH and complexation effects; volatilization and vacuum distillation techniques; applications to natural and synthetic products analysis; electrochemical methods.

Academic Org Chemistry and Biology

Components Laboratory: 2.00 / Lecture: 1.00

Requisites Prerequisite: CHY 223
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CHY 434

Course ID	003456
Short Title	Analytical Chem-Complex Sample
Long Title	Analytical Chemistry of Complex Samples
Long Descr	Sampling techniques, chemical analysis and statistical methods for analyzing major and minor analytes in complex matrices. Relevance to food, environmental, clinical, or industrial samples will be discussed. Laboratory work will introduce techniques such as Sohxlet and differential extraction, and methods for reducing matrix effects.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00 / Laboratory: 3.00
Requisites	Prerequisite: CHY 330
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CHY 435

Course ID	000385
Short Title	Adv. Chemical Instrumentation
Long Title	Advanced Chemical Instrumentation
Long Descr	A selection of rapidly evolving instrumental techniques significant to the chemical industry and chemical research will be presented with specific reference to what is currently state-of-the art. Topics may include advances in chromatography, spectroscopy, mass spectroscopy, surface science techniques and microprobe analysis.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00
Requisites	Prerequisite: CHY 223 and CHY 330
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CHY 436

Course ID	005941
Short Title	Pharmaceutical Chemistry
Long Title	Pharmaceutical Chemistry
Long Descr	This course provides an introduction to medicinal chemistry. Topics examined include classification, pharmacokinetics, mechanisms of action (pharmacodynamics), interactions, formulations, production and design of drugs, including biotechnology drugs. Drugs are grouped by their common mechanism(s) of action and discussed as such.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00
Requisites	Prerequisites: BCH 261 and CHY 142
Equivalencies	
Attributes	Case Studies
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CHY 437

Course ID 005417

Short Title Organic Chemistry

Long Title Organic Chemistry

Long Descr This course emphasizes the stereochemistry of common reaction mechanisms. Also included is enolate and carbanion chemistry, Diels-Alder reaction in detail, heterocyclic chemistry, polycyclic compounds and a survey of the mechanisms of a large number of name reactions.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisite: CHY 242
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CHY 445

Course ID 000838

Short Title Materials Chemistry

Long Title Materials Chemistry

Long Descr This course addresses solid inorganic, organic and nano-materials from synthetic, characterization, structure/properties and applications perspectives, providing a suitable breadth and depth of coverage of modern materials. Topics may include the theory and chemistry of organic polymers, metals, semiconductors, carbon-based materials, mesoporous materials, metal-organic frameworks, metal nanoparticles and principles of plasmonics.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisites: CHY 242 and CHY 344 and CHY 381
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CHY 447

Course ID 024954

Short Title Solid State Chemistry

Long Title Solid State Chemistry

Long Descr Ionic networks and solids are at the leading edge of many new technologies. This course focuses on the structure and properties of the solid state. Topics include; crystal structures, bonding in solids, crystallography, crystal defects, phase diagrams, solid state characterization, and the optical, magnetic and electronic properties of solids. Applications (superconductors, semiconductors, piezoelectrics, solid oxide fuel cells and ferromagnetism) will be discussed.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisites: CHY 113 and CHY 249
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CHY 449

Course ID 004443

Short Title Inorganic Chemistry II

Long Title Inorganic Chemistry II

Long Descr An introduction to the coordination chemistry of the transition metals. Topics include structure and bonding, electronic spectroscopy, reaction mechanisms, organometallic chemistry and bioinorganic chemistry. The laboratory will consist of the preparation and spectroscopic characterization of various transition metal complexes.

Academic Org Chemistry and Biology

Components Lecture: 3.00 / Laboratory: 3.00

Requisites Prerequisite: CHY 344
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CHY 482

Course ID 000262

Short Title Selected Topics in Chemistry

Long Title Selected Topics in Chemistry

Long Descr Recent developments and topics of current interest in chemistry and their applications will be included. A variety of instructional modes will be used e.g. lecture, seminar, guest speakers, student presentations, demonstration and practice.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisites: CHY 223 and CHY 242 and CHY 344
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit Y
Total Completions 3
Course Topics 1. Fundamentals and Applications of Colloidal Systems
2. Green Chemistry for the C21st
3. Colliods in Food and Soft Materials

CHY 500

Course ID 022872

Short Title Directed Studies

Long Title Directed Studies

Long Descr This course is for upper year chemistry students who wish to gain knowledge about a specific area of chemistry for which no current choice is offered. The work prepared for this course must not be the same as that submitted for any other course, and the topic must be different from the laboratory thesis project. See teaching department for consent criteria.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites
Equivalencies

Attributes Research Project
Dept Consent Department Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CHY 501

Course ID 023499

Short Title Polymer Chemistry

Long Title Polymer Chemistry

Long Descr This course focuses on the synthesis, properties and applications of organic and inorganic polymers, dendrimers, and biopolymers. Topics will include the preparation, isolation, and characterization of polymeric materials. Conventional methods of polymerization used in industry, including free radical, living, and step growth will be examined in detail. Polymer applications will focus on the use of "smart materials" that possess useful conductive, optical, and self-healing properties.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisites: CHY 242 and CHY 449
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CHY 502

Course ID	023500
Short Title	Organometallic Chemistry
Long Title	Organometallic Chemistry
Long Descr	This advanced level course will deal with recent topics in organometallic chemistry, including such areas as organo-lithium and organo-magnesium reagents; stoichiometric organic transformations using metals; and metal-catalyzed reactions such as hydrogenation, cross coupling, C-H and C-C bond activation and polymerization.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00
Requisites	Prerequisites: CHY 339 and CHY 449
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CHY 547

Course ID 004266

Short Title Food Chemistry

Long Title Food Chemistry

Long Descr The quantitative analysis of foods using chemical, physical, and instrumental approaches is introduced, along with statistical methods relevant to quality control and the development of food products. Certain aspects of food processing operations are discussed to provide a better understanding of food properties.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisite: BCH 261

Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CHY 583

Course ID 024956

Short Title Alternative Energies

Long Title Alternative Energies

Long Descr The focus of this course is on carbon-free renewable energies. Students will first examine the use of carbon-based fuels, and compare and contrast these fuels to carbon-free alternatives including solar, wind, water, hydrogen, and nuclear energies. The course will emphasize qualitative rather than quantitative concepts, and will include social, economic, and environmental impacts of these alternative energy sources.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Not available to Faculty of Engineering and Architecture students, nor Faculty of Science students (with the exception of Computer Science, Financial Mathematics and Mathematics and its Applications).

Equivalencies

Attributes Upper Level Liberal Studies
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CHY 599

Course ID	024747
Short Title	Business of Chem and Bio
Long Title	The Business of Chemistry and Biology
Long Descr	A general and conceptual discussion of the biology and chemistry behind consumer and industrial products. Emphasis will be on the innovations that laid the foundation for these products and how they have impacted the economy and/or society. Also to be considered are the challenges related to commercializing innovation from both a consumer and competitive point of view. Case studies will be used to illustrate specific topics.
Academic Org	Chemistry and Biology
Components	Lecture: 3.00
Requisites	Not available to Faculty of Engineering and Architecture Students (with the exception of Architecture)
Equivalencies	
Attributes	Case Studies, Upper Level Liberal Studies
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CHY 600

Course ID 010232

Short Title Organic Reaction Mechanisms

Long Title Organic Reaction Mechanisms

Long Descr Reaction mechanisms and the stability and reactivity to key organic reaction intermediates. Free energy relationships. Transition state theory and the description of stereo and electronic control in organic reactions.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisites: CHY 242
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CHY 706

Course ID 010245

Short Title Computational and Quantum Chem

Long Title Computational and Quantum Chemistry

Long Descr Basic and advanced molecular modelling: molecular mechanics and dynamics; electronic structure calculations (model chemistries, energy calculations, geometry optimizations, prediction of chemical properties); theoretical methods (Hartree-Fock theory, electron correlation methods, density functional theory, excited state methods); calculation and prediction of molecular spectra.

Academic Org Chemistry and Biology

Components Lecture: 3.00

Requisites Prerequisites: CHY 242 and CHY 382
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

WKT 405

Course ID 024332

Short Title Work Term I Science

Long Title Work Term I - Science

Long Descr Co-op position must be engineering or science related. Routine types of positions are acceptable. This course is graded on a pass/fail basis.

Academic Org Chemistry and Biology

Components Lecture: 1.00

Requisites
Equivalencies

Attributes Co-operative Education
Dept Consent Department Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Pass/Fail
Hegis Code
GPA Weight 0.00/0.00
Billing Units 0.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

WKT 505

Course ID 024333

Short Title Work Term II Science

Long Title Work Term II - Science

Long Descr Co-op position must be engineering or science related. Routine type of positions are acceptable. This course is graded on a pass/fail basis.

Academic Org Chemistry and Biology

Components Lecture: 1.00

Requisites
Equivalencies

Attributes Co-operative Education
Dept Consent Department Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Pass/Fail
Hegis Code
GPA Weight 0.00/0.00
Billing Units 0.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

WKT 506

Course ID 024334

Short Title Work Term III Science

Long Title Work Term III - Science

Long Descr Co-op position must be discipline related. Position should involve project work but some routine work is acceptable. This course is graded on a pass/fail basis.

Academic Org Chemistry and Biology

Components Lecture: 1.00

Requisites
Equivalencies

Attributes Co-operative Education
Dept Consent Department Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Pass/Fail
Hegis Code
GPA Weight 0.00/0.00
Billing Units 0.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

WKT 605

Course ID 024335

Short Title Work Term IV Science

Long Title Work Term IV - Science

Long Descr Co-op position must be discipline related and should involve project work. This course is graded on a pass/fail basis.

Academic Org Chemistry and Biology

Components Lecture: 1.00

Requisites
Equivalencies

Attributes Co-operative Education
Dept Consent Department Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Pass/Fail
Hegis Code
GPA Weight 0.00/0.00
Billing Units 0.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

WKT 606

Course ID 024336

Short Title Work Term V Science

Long Title Work Term V - Science

Long Descr Co-op position must be discipline related and should involve project work. This course is graded on a pass/fail basis.

Academic Org Chemistry and Biology

Components Lecture: 1.00

Requisites
Equivalencies

Attributes Co-operative Education
Dept Consent Department Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Pass/Fail
Hegis Code
GPA Weight 0.00/0.00
Billing Units 0.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 40A

Course ID 020190

Short Title Thesis-A

Long Title Thesis-A

Long Descr The student will creatively apply the material learned in core courses to a significant problem. See teaching department for consent criteria.

Academic Org Computer Science

Components Laboratory: 3.00

Requisites
Equivalencies

Attributes Capstone, Research Project
Dept Consent Department Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Multi-Term Course: Not Graded
Hegis Code
GPA Weight 0.00/0.00
Billing Units 1.0
Course Count 0.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 40B

Course ID 020191

Short Title Thesis-B

Long Title Thesis-B

Long Descr The student will creatively apply the material learned in core courses to a significant problem.

Academic Org Computer Science

Components Laboratory: 3.00

Requisites Prerequisite: CPS 40A
Equivalencies CPS40B/CPS40

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 2.00/2.00
Billing Units 1.0
Course Count 2.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 101

Course ID 025630

Short Title Intro to App Development

Long Title Introduction to App Development

Long Descr This course introduces programming to non-computer science majors. Students will learn how to program apps for mobile devices using a visual programming. Topics include: basic programming concepts (conditionals, events, variables, loops, procedures), using device sensors and components (camera, accelerometer, gyroscope, GPS, audio, internet connectivity), designing and implementing apps (user interface, texting apps, files I/O, drawing apps, creating interactive games). The programming language used in this course is MIT App Inventor 2.

Academic Org Computer Science

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Antirequisite: Not available for Computer Science students (CS001, CS002).
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 106

Course ID 024282

Short Title Multimedia Computation

Long Title Introduction to Multimedia Computation

Long Descr Introduction to computing and programming. This course introduces the student to computers and how to solve problems by developing algorithms and writing programs.
The programming language is Python, and the problems are taken from the domain of
multimedia.

Academic Org Computer Science

Components Lecture: 3.00 / Laboratory: 2.00

Requisites Antirequisite: CPS 109
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 109

Course ID 004554

Short Title Computer Science I

Long Title Computer Science I

Long Descr An introductory programming course designed to introduce fundamental Computer Science concepts such as abstraction, modelling and algorithm design. Emphasis is placed on producing correct software.

Academic Org Computer Science

Components Lecture: 3.00 / Laboratory: 2.00

Requisites Antirequisite: CPS 106
Equivalencies CIBM109/CKCS109/CPS109

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 118

Course ID 010218

Short Title Intro Prog for Scientists

Long Title Introductory Programming for Scientists

Long Descr This course is an introduction to computer science, computers and programming for science students. Topics covered include: algorithmic thinking, computational approaches to solving problems, programming fundamentals such as elementary data structures, arrays, and basic constructs provided by high-level programming languages: sequencing, selection, iteration, and functions. Additional topics may include: numerical computation, GUI interface, and case studies of scientific computing. This course uses MATLAB as its programming language along with a brief introduction to Python.

Academic Org Computer Science

Components Lecture: 3.00 / Laboratory: 2.00

Requisites
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 125

Course ID 004758

Short Title Digital Computation and Prog

Long Title Digital Computation and Programming

Long Descr This course is for Engineering students and introduces concepts, theory and practice of computer programming, using the C programming language. Topics covered include: C program form, language statements, pseudo-code algorithmic representation, numeric data types, flow of control with selection and repetition, standard C libraries, functions and call modes, arrays, pointers, sorting, matrix operations, character and string data types, dynamic storage, structures and linked lists, file I/O.

Academic Org Computer Science

Components Lecture: 3.00 / Laboratory: 2.00

Requisites Antirequisite: CPS188
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1

Course Topics

CPS 125E

Course ID	004758
Short Title	Digital Computation and Prog
Long Title	Digital Computation and Programming
Long Descr	This course is for Engineering students and introduces concepts, theory and practice of computer programming, using the C programming language. Topics covered include: C program form, language statements, pseudo-code algorithmic representation, numeric data types, flow of control with selection and repetition, standard C libraries, functions and call modes, arrays, pointers, sorting, matrix operations, character and string data types, dynamic storage, structures and linked lists, file I/O.
Academic Org	Computer Science
Components	Lecture: 3.00 / Laboratory: 2.00
Requisites	Antirequisite: CPS188
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CPS 171

Course ID 026877

Short Title Intro to Cyber-Secure Coding

Long Title Introduction to Cyber-Secure Coding

Long Descr This course is about software assurance through defensive programming, reviews, and unit testing. The course also introduces concepts in computer programming, such as abstraction and algorithm design, data, program representation and translation, and offers an introduction to the historical and social context of computing.

Academic Org Computer Science

Components Lecture: 3.00 / Laboratory: 1.00

Requisites
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 188

Course ID 026840

Short Title Computer Prog. Fundamentals

Long Title Computer Programming Fundamentals

Long Descr This course is for Engineering students and introduces concepts, theory and practice of computer programming, using the C programming language. It serves as a foundational course for higher year programming dependent engineering courses. In-depth emphasis is on program form/organization, pseudo-code, data types, conditional expressions, repetition, standard C libraries, casting,functions, arrays, pointers, sorting, recursion, matrix operations, dynamic storage, structures, linked lists, I/O.

Academic Org Computer Science

Components Lecture: 4.00 / Laboratory: 2.00

Requisites Antirequisite: CPS125
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 188E

Course ID	026840
Short Title	Computer Prog. Fundamentals
Long Title	Computer Programming Fundamentals
Long Descr	This course is for Engineering students and introduces concepts, theory and practice of computer programming, using the C programming language. It serves as a foundational course for higher year programming dependent engineering courses. In-depth emphasis is on program form/organization, pseudo-code, data types, conditional expressions, repetition, standard C libraries, casting,functions, arrays, pointers, sorting, recursion, matrix operations, dynamic storage, structures, linked lists, I/O.
Academic Org	Computer Science
Components	Lecture: 4.00 / Laboratory: 2.00
Requisites	Antirequisite: CPS125
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CPS 209

Course ID	002406
Short Title	Computer Science II
Long Title	Computer Science II
Long Descr	A continuation of CPS 109. Emphasis is placed on code structure, algorithm development, and Object Oriented design principles.
Academic Org	Computer Science
Components	Lecture: 3.00 / Laboratory: 2.00
Requisites	Prerequisite: CPS 109 or CPS 106
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CPS 213

Course ID	005528
Short Title	Computer Organization I
Long Title	Computer Organization I
Long Descr	This course introduces the students to the principles and fundamentals of digital system design. Topics covered include: Binary numbers, base conversions, signed numbers, Boolean algebra, logic gates, K-map method, combinational circuits, decoders/encoders, multiplexers, sequential circuits, flip-flops, state diagram, registers, counters and addressing techniques. (2 hr Lab every other week).
Academic Org	Computer Science
Components	Lecture: 3.00 / Laboratory: 2.00
Requisites	
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CPS 270

Course ID 025874

Short Title Data Access and Management

Long Title Data Access and Management

Long Descr This course presents the fundamental concepts of database design and database management. Topics covered include: relational data modeling, databases and DBMSs, relational algebra and SQL, persistent stored modules, and three-tier architecture. This course will also include an overview of data warehousing, XML, NoSQL databases and normal forms.

Academic Org Computer Science

Components Lecture: 3.00 / Laboratory: 1.00

Requisites
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 305

Course ID 005099

Short Title Data Structures

Long Title Data Structures

Long Descr Introduction to data structures and algorithms. Data structures covered will include stacks, queues, lists, trees, and graphs. Algorithm topics will include searching, sorting, hashing, algorithm design, greedy approaches, dynamic programming, recursion and complexity analysis.

Academic Org Computer Science

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Prerequisites: CPS 209
Equivalencies CIBM305/CPS305

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 310

Course ID 001686

Short Title Computer Organization II

Long Title Computer Organization II

Long Descr A continuation of CPS 213. Memory; CPU architecture and instruction set; the instruction processing sequence; generic assembler level programming illustrated for specific CPUs; I/O essentials including interrupts and DMA; characteristics of major peripherals interfaces; RISC and CISC architectures compared; parallel processing. The laboratory requires using a specific assembler/editor for the creation of programs illustrating some of the principles discussed in lectures.

Academic Org Computer Science

Components Lecture: 3.00 / Laboratory: 2.00

Requisites Prerequisite: CPS 211 or CPS 213
Equivalencies CPS207/CPS310

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 371

Course ID 026878

Short Title Intro to Security Protocols

Long Title Introduction to Security Protocols

Long Descr This course is designed to provide a high level overview of common Web Security and Network Security protocols, such as HTTP, TCP/IP, UDP, SSH, DNS, TLS, etc. The focus of the course will be on understanding the high level design of the protocols, their vulnerabilities and how to prevent basic attacks.

Academic Org Computer Science

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Prerequisites: CPS 571
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 393

Course ID 002461

Short Title Introduction to C and UNIX

Long Title Introduction to UNIX, C and C++

Long Descr The course introduces the UNIX operating system, and the C and C++ languages. UNIX topics include: I/O, redirection, processes, and shell scripts. C and C++ are introduced with an emphasis on differences from previously studied languages. C topics include pointers, structures, memory allocation, and paradigm differences. C++ topics include class formalisms, static and dynamic instantiation, inheritance, constructors and destructors, polymorphism with virtual functions, operator overloading, and time permitting, friends. Stream I/O may be introduced.

Academic Org Computer Science

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Prerequisite: CPS 209
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 406

Course ID 002013

Short Title Intro to Software Engineering

Long Title Introduction to Software Engineering

Long Descr This course introduces the study of Object-Oriented software engineering. Topics include software project management, requirements gathering, requirements analysis, modeling, design, implementation and testing. UML diagrams and design patterns are also discussed. A major portion of the course is a team project, taking a system from the initial requirements to the final implementation. (2 hr Lab every other week).

Academic Org Computer Science

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Prerequisite: CPS 311 or CPS 209
Equivalencies CPS406/CPS405

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 412

Course ID	024939
Short Title	Soc Issues, Ethics and Profess
Long Title	Social Issues, Ethics and Professionalism
Long Descr	This course will cover some of fundamental social, legal, and ethical issues inherent in the discipline of computing. Topics include social context, analytical tools, professional ethics, intellectual property, privacy and civil liberties, professional communication, sustainability and equity issues.
Academic Org	Computer Science
Components	Lecture: 3.00
Requisites	
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CPS 420

Course ID 024940

Short Title Discrete Structures

Long Title Discrete Structures

Long Descr Introduction to discrete structures as they apply to design and analysis. Review of proof techniques. Induction and recursion. Graphs and trees, and their applications in computing. Finite automata and regular expressions. Counting: arithmetic and geometric progressions, permutations and combinations, modular arithmetic.

Academic Org Computer Science

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Prerequisite: CPS 305, MTH 110; Antirequisite: MTH 210

Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 471

Course ID 026879

Short Title Software Security Fundamentals

Long Title Software Security Fundamentals

Long Descr This course provides a continuation of software assurance presented in Introduction to Cyber-Secure Coding (CPS 171), introduces non-procedural programming to students with a background in the procedural paradigm, and provides an overview of basic searching and sorting techniques.

Academic Org Computer Science

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Prerequisite: CPS 171; Antirequisite: CPS 633

Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 501

Course ID 010199

Short Title Bioinformatics

Long Title Bioinformatics

Long Descr Introduction to analysis, management, and visualization of cellular information at the molecular level. The course includes an overview of mathematical modeling and simulation, pattern matching, methods for phylogenetics, gene recognition, distributed and parallel biological computing, designing and managing biological databases (both relational and object-oriented), linking disparate databases and data, data mining, reasoning by analogy, hypothesis formation and testing by machine.

Academic Org Computer Science

Components Lecture: 3.00

Requisites Prerequisites: (CPS 106 or CPS 109 or CPS 118 or CPS 125) and BLG 143; Antirequisite: BME 501

Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 506

Course ID 002869

Short Title Comparative Prog Languages

Long Title Comparative Programming Languages

Long Descr A survey of major programming paradigms, with emphasis on the functional paradigm. Discussion of data typing, program decomposition, scoping rules, control structures parameter passing. Programming languages will likely include commercially important functional languages such as Haskell, Clojure and Erlang, with examples of others as time permits.

Academic Org Computer Science

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Prerequisites: CPS 209

Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 510

Course ID	005106
Short Title	Database Systems I
Long Title	Database Systems I
Long Descr	Advanced file management techniques involving fundamentals of database organization, design and management. Emphasis is given to Relational Database Management Systems including relational algebra, normal Forms, physical Database Structures and their implementation, and Relational Database Languages. Other types of Database Managers are also discussed such as Hierarchical, Network and Inverted Files.
Academic Org	Computer Science
Components	Lecture: 3.00 / Laboratory: 1.00
Requisites	Prerequisite: CPS 305 or (COE 428 and COE 528); Antirequisite: ITM 500
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CPS 511

Course ID 000679

Short Title Computer Graphics

Long Title Computer Graphics

Long Descr Software and hardware considerations in computer graphics. Mathematical manipulation of graphical objects; interactive graphics and the user interface; representation of 3-D shapes; fundamental implementation of algorithms.

Academic Org Computer Science

Components Lecture: 3.00

Requisites Prerequisites: CPS 305 and MTH 108
Equivalencies CIBM511/CPS511

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 521

Course ID 026839

Short Title Introduction to Data Science

Long Title Introduction to Data Science

Long Descr This course is an introduction to different aspects of data science. The focus is on data collection and management and then applying data analytics, statistical and machine learning models on the collected data. The topics of the course include big data, data models, distributed computing, regression and statistical analysis, neural networks, support vector machines, scalable machine learning models, basics of natural language processing, recommendation systems, and analyzing social graphs. All these topics will be discussed at the introductory level.

Academic Org Computer Science

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Prerequisites: CPS 209 and (MTH 380 or MTH 304)
Equivalencies

Attributes Capstone, Research Project
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 530

Course ID 004714

Short Title Web Systems Development

Long Title Web Systems Development

Long Descr This course presents the concepts and applications of the technologies to design and develop creative and successful web services. It covers design fundamentals and also programming languages for both server-side and client-side environments. Responsive design, search engine optimization and monetization strategies are also introduced.

Academic Org Computer Science

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Prerequisite: CPS 209
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 571

Course ID 026880

Short Title Introduction to Cyber-Security

Long Title Introduction to Cyber-Security

Long Descr This course provides a broad overview of key cybersecurity concepts and practices and broadly characterizes the organizational security landscape. It covers foundational security principles, organization risk management, and adversarial thinking as an organizing narrative for a series of content on data security, system security, and internet security. Practical skills such as cyber hygiene and personal device protection for personal security are also emphasized.

Academic Org Computer Science

Components Lecture: 3.00

Requisites
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 590

Course ID	001660
Short Title	Operating Systems I
Long Title	Operating Systems I
Long Descr	Introduction to O/S (system calls, interrupts, synchronous and asynchronous traps, O/S structure), using processes (process communication and synchronization), primitive communications (signals and signal management calls), pipes, messages, semaphores, shared memory, memory management, file systems, and (time permitting) remote procedure calls.
Academic Org	Computer Science
Components	Lecture: 3.00 / Laboratory: 1.00
Requisites	Prerequisite: CPS 305 and CPS 393
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CPS 606

Course ID 001487

Short Title Advanced Computer Organization

Long Title Advanced Computer Organization

Long Descr An advanced overview of computer architecture and organization. A study of the relationship between software and hardware and how this affects the design of architectural features: instruction execution, processor internals (including pipelining, parallelism and microcode). Instruction sets, memory and caches, busses, auxiliary storage (disk) controllers and vector processors.

Academic Org Computer Science

Components Lecture: 3.00

Requisites Prerequisite: CPS 310
Equivalencies CIBM606/CPS606

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 607

Course ID 001459

Short Title Autonomous Mobile Robotics

Long Title Autonomous Mobile Robotics

Long Descr An introductory course in the design and implementation of autonomous vehicles. Topics will include the nature of autonomy and autonomous behaviour. Issues involving sensing and actuation will be discussed. Students will be introduced to the constraints and issues involved in building systems designed to interact with an environment independently. Students will be expected to construct working robots.

Academic Org Computer Science

Components Lecture: 3.00 / Laboratory: 2.00

Requisites Prerequisite: CPS 106 or CPS 109 or CPS 125 or CPS 188
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 610

Course ID 001864

Short Title Database Systems II

Long Title Database Systems II

Long Descr This course is a continuation of CPS510. Topics include: embedded DB languages (e.g. JDBC class libraries) and Embedded SQL, Transaction management, Distributed Databases, Transaction Concurrency Control, Concurrency Control through Locking/protocol and time stamps, Object-Oriented and Object-Relational Database Systems, non-structured and NOSQL databases (e.g. Mongo DB). Introduction to big data management, Map-Reduce and Hadoop.

Academic Org Computer Science

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Prerequisite: CPS 510
Equivalencies CIBM610/CPS610

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 613

Course ID 000500

Short Title Human-Computer Interaction

Long Title Human-Computer Interaction

Long Descr This course introduces the concepts of human-computer interaction and usability testing. Topics include: human information processing, usability principles, models of interaction, user interface paradigms, design of user interfaces. Students will also learn how to develop Graphical User Interfaces using a specific User Interface Management system.

Academic Org Computer Science

Components Lecture: 3.00 / Laboratory: 2.00

Requisites Prerequisite: CPS 209
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 615

Course ID	002504
Short Title	Theory of Computation
Long Title	Theory of Computation
Long Descr	This course introduces students to the theory of computation. Topics include: regular expressions and languages, finite state automata, context-free languages, pushdown automata, Turing machines, computability, and NP-completeness.
Academic Org	Computer Science
Components	Lecture: 4.00
Requisites	Prerequisites: CPS 305 and CPS 420
Equivalencies	CPS615/MTH405
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CPS 616

Course ID	000803
Short Title	Algorithms
Long Title	Algorithms
Long Descr	Complexity analysis and order notations, recurrence equations, brute force, divide-and-conquer techniques and the master theorem, transform-and-conquer and problem reduction, greedy method, dynamic programming, the knapsack and travelling salesman problems, graph algorithms, text processing and pattern matching techniques, P, NP, and NP-complete classes.
Academic Org	Computer Science
Components	Lecture: 3.00 / Laboratory: 1.00
Requisites	Prerequisites: (CPS 305 and MTH 210) or (CPS 305 and CPS 420); Antirequisite: CPS688
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CPS 621

Course ID 002207

Short Title Intro to Multimedia Systems

Long Title Introduction to Multimedia Systems

Long Descr Multimedia data is becoming increasingly important in many scientific and commercial arenas. In this course, students will be introduced to principles and current technologies of multimedia system design. Topics include: multimedia data representation, processing multimedia visual information, video and audio compression, retrieval of multimedia data, such as text, graphics, colour images and video. In addition, issues related to multimedia hardware and software as well as specific applications will be discussed.

Academic Org Computer Science

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Prerequisites: (CPS 106 or CPS 109) and CPS 393
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 630

Course ID 004987

Short Title Web Applications

Long Title Web Applications

Long Descr This course is a continuation of CPS 530. Students will learn advanced techniques for designing and building (client and server) web applications using modern technologies. Topics include: web application development process, cross browser compatibility issues, responsive design, templating and database connectivity and web security, modular design and various web frameworks. At the end of this course students will be able to design and implement a database application with a commercial grade web interface for desktop and mobile computing platforms. (2 hr. Lab every other week).

Academic Org Computer Science

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Prerequisite: CPS 510 and CPS 530
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1

Course Topics

CPS 633

Course ID	005680
Short Title	Computer Security
Long Title	Computer Security
Long Descr	History and examples of computer crime. Security policies and mechanisms. Access control models. Implementation and usability issues. Physical security. Authentication technologies. Operating system security. Encryption algorithms and protocols. External and internal firewalls. Software flaws and malware. Ethical issues in computer security. Sample privacy noncompliance litigation cases, Social implications of computing networked communication.
Academic Org	Computer Science
Components	Lecture: 3.00 / Laboratory: 1.00
Requisites	Prerequisite: CPS 393; Antirequisite: CPS 471
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CPS 643

Course ID 026098

Short Title Virtual Reality

Long Title Virtual Reality

Long Descr This course describes the underlying concepts and algorithms of Virtual Reality (VR) systems. A review of current VR technology and the fundamental principles of interaction, modelling and simulation for VR are presented. This is a lab-based and project-based course in which students will use VR hardware and a VR software framework to design, model and program an interactive virtual environment for various application areas.

Academic Org Computer Science

Components Lecture: 3.00 / Laboratory: 2.00

Requisites Prerequisite: CPS 511

Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 650

Course ID 024742

Short Title Computational Thinking

Long Title Computational Thinking in Our World

Long Descr This course will discuss why computers and computation are ubiquitous in our world and the implications of that ubiquity, including security, gaming, military, GPS, social-networks, stock-trading, voting, and beyond. Students will learn how these systems work at an appropriate level of detail. To give a deeper understanding of these topics a significant component of the course will be student programming labs to explore simple versions of these systems. No previous programming experience will be required.

Academic Org Computer Science

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Not available to Computer Science, Faculty of Engineering and Architectural Science students.

Equivalencies

Attributes Lab Work, Upper Level Liberal Studies
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 688

Course ID	026547
Short Title	Adv. Algorithms
Long Title	Advanced Algorithms
Long Descr	Algorithms with an engineering emphasis. Topics include algorithms with numbers, divide-and-conquer algorithms, decompositions of graphs, paths in graphs, greedy algorithms, dynamic programming, linear programming and reductions, NP-complete problems, coping with NP-completeness, quantum algorithms.
Academic Org	Computer Science
Components	Lecture: 3.00 / Laboratory: 2.00
Requisites	Prerequisite: COE 428; Antirequisite: CPS 616
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CPS 706

Course ID	004012
Short Title	Computer Networks I
Long Title	Computer Networks I
Long Descr	Internet, the network edge, the network core, delay, loss and throughput, protocol layers. Application Layer: principles of network applications, web. Transport Layer -UDP, connection oriented transport TCP, TCP congestion control. Network layer -The internet protocol (IP): Forwarding and addressing in the Internet. Routing algorithms. The link layer and local area networks.
Academic Org	Computer Science
Components	Lecture: 3.00 / Laboratory: 1.00
Requisites	Prerequisite: CPS 590
Equivalencies	CIBM706/CKCS706/CPS706
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CPS 707

Course ID	004876
Short Title	Software Verificatn/Validation
Long Title	Software Verification and Validation
Long Descr	This course introduces the topics of verification and validation of computer software. Material covered may include statistical and functional approaches to testing, test data analysis, testability, static analysis techniques, dynamic analysis techniques, selected state-of-the-art results, and real-world applications.
Academic Org	Computer Science
Components	Lecture: 3.00 / Laboratory: 1.00
Requisites	Prerequisites: CPS 406 and CPS 420 and (MTH 380 or MTH 304)
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CPS 710

Course ID 005283

Short Title Compilers and Interpreters

Long Title Compilers and Interpreters

Long Descr Introduction to compiler design: theory, techniques, and tools. Students will develop an interpreter or compiler. Assembler and preprocessors will also be briefly discussed.

Academic Org Computer Science

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Prerequisite: (CPS 305 or COE 428) and (CPS 420 or MTH 314)
Equivalencies CIBM710/CPS710

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 713

Course ID 024299

Short Title Applied Cryptography

Long Title Applied Cryptography

Long Descr The notion of secure communication. Classical cryptography. Pseudo-random number generation. The Data Encryption Standard and Advanced Encryption Standard. Cryptographically secure hash functions. Public key crypto system. Digital signature schemes. E-commerce and digital cash. Secret sharing schemes. Authentication applications. Electronic mail security. IP and Web security.

Academic Org Computer Science

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Prerequisite: CPS 209 and CPS 633
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 714

Course ID 024300

Short Title Software Project Management

Long Title Software Project Management

Long Descr Introduction to issues involved in managing large, complex software projects. Introduction to industry-standard project management techniques and tools needed to use them, as well as their application to software projects.

Academic Org Computer Science

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Prerequisite: CPS 406 or (COE 691 and COE 692); Antirequisite: ITM 750
Equivalencies

Attributes Research Project
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 716

Course ID 024301

Short Title Computer Networks II

Long Title Computer Networks II

Long Descr Advanced Internet routing algorithms (inter-AS routing, broadcast and multicast routing, switch design). Advanced data link layer topics (virtual local area networks, multi-protocol label switching). Multimedia Networking (streaming, real-time transport protocols, content distribution networks, scheduling and policing algorithms, providing quality of service). Wireless/Mobile Networks, (cellular networks, WiFi, mobility management, routing in MANET). Network Management. Special topics in networking.

Academic Org Computer Science

Components Lecture: 3.00

Requisites Prerequisites: CPS 706
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 721

Course ID	005731
Short Title	Artificial Intelligence I
Long Title	Artificial Intelligence I
Long Descr	This course provides introduction to several important AI problems and techniques, including knowledge representation and reasoning, constraints satisfaction, search, natural language understanding, planning, uncertainty, belief networks, learning.
Academic Org	Computer Science
Components	Lecture: 3.00 / Laboratory: 1.00
Requisites	Prerequisites: CPS 305 and CPS 420 and (MTH 380 or MTH 304)
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CPS 730

Course ID	022368
Short Title	Web Tech and Perf Measurement
Long Title	Web Technology and Performance Measurement
Long Descr	This course focuses on understanding the core technologies underlying the World Wide Web, such as protocols (e.g., HTTP) , software components (i.e., client, server and proxy) and important web applications (e.g., web caching). Another part of this course is introduction to performance measurement and in particular Web Performance Measurement. The course consists of assignments and practical examples (based on Unix/Linux) which helps students to understand the principles of how distributed applications are built.
Academic Org	Computer Science
Components	Lecture: 3.00 / Laboratory: 1.00
Requisites	Prerequisite: CPS 393 or CPS 590
Equivalencies	
Attributes	Case Studies, Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CPS 731

Course ID 005505

Short Title Software Engineering I

Long Title Software Engineering I

Long Descr Essential methods for the Systematic approach to the development, operation, maintenance, and retirement of Software. Software Life Cycles, process modelling, configuration management, managing Software quality, requirements analysis, specification, verification and validation, Software design, implementation, testing and maintenance. Software Tools, CASE tools and documentation. (2 hr. Lab every other week)

Academic Org Computer Science

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Prerequisite: CPS 406
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 752

Course ID 002813

Short Title Parallel Computer Systems

Long Title Parallel Computer Systems

Long Descr The topics of this course centre around the concepts of parallel processors and supercomputers with emphasis on processor technology, performance, and software, parallel computer models, program flow control and scheduling, metrics and measures, scalability of parallel algorithms, memory hierarchy technology, pipeline design, multivector and SIMD organizations, scalability and multithreading, software and compliers, case studies of the CRAY Y-MP and CM-5 environments.

Academic Org Computer Science

Components Lecture: 3.00

Requisites Prerequisite: CPS 310
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 775

Course ID	027062
Short Title	Mobile Applications in Eng
Long Title	Mobile Applications in Engineering
Long Descr	This course gives an introduction to the growing field of mobile applications with focus on the Android platform as a prototyping platform. The course covers mobile application development frameworks; architecture, design and Engineering issues, techniques, methodologies for mobile applications Development.
Academic Org	Computer Science
Components	Lecture: 3.00 / Laboratory: 1.00
Requisites	Prerequisites: CPS 209, CPS 510, CPS 406
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CPS 801

Course ID 002326

Short Title Operating Systems II

Long Title Operating Systems II

Long Descr This course covers the principal internal functions of operating systems with particular emphasis on UNIX/Linux and systems programming. Topics covered in this course are: OS structure, process management (including concurrency and synchronization), memory management, file systems, input-output and device management, and elements of distributed systems.

Academic Org Computer Science

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Prerequisites: CPS 305 and CPS 590
Equivalencies CIBM801/CPS801

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 803

Course ID 026367

Short Title Machine Learning

Long Title Machine Learning

Long Descr Machine learning involves the study of algorithms capable of learning from data or prior experience. This course develops an aptitude for applying machine learning algorithms to different problem domains while at the same time, understanding the theoretical basis for machine learning algorithms. Machine learning has many applications in medicine, autonomous systems, computational biology, finance, computer vision and other domains.

Academic Org Computer Science

Components Lecture: 3.00

Requisites Prerequisites: MTH 108 and MTH 207 and CPS 305 and (MTH 380 or MTH 304)
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 811

Course ID 004536

Short Title Distributed Sys and Networks

Long Title Distributed Systems and Networks

Long Descr A continuation of CPS 706. This course deals with the concepts of internetworking as an extension of data communications. Topics will include routing and the TCP/IP suite of protocols. An introduction to X Windows programming allows students to investigate the aspects of distributed systems using Remote Procedure Calling, shared files and directories, NFS and NIS, the Internet, and other Distributed Computing Environments. Case studies will involve NFS, Amoeba, Mach and Grapevine. Concurrency aspects will be considered in the topics of collaborating servers and file replication.

Academic Org Computer Science

Components Lecture: 3.00

Requisites Prerequisite: CPS 706
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 813

Course ID 022369

Short Title Human Robot Interaction

Long Title Human Robot Interaction

Long Descr From the first time a human picked up a stick and attempted to knock down food from an unreachable branch we have attempted to use technology to extend our influence on the world. This course will examine physical robotic systems designed to extend human presence to remote locations. Topics may include Presence, Situational Awareness, Telerobotics and Agency. The course is designed to provide students with a practical introduction that will involve the design and construction of working robotic systems designed to interact with remote environments.

Academic Org Computer Science

Components Lecture: 3.00 / Laboratory: 2.00

Requisites Prerequisite: CPS 607
Equivalencies

Attributes Case Studies, Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N

Total Completions 1
Course Topics

CPS 815

Course ID	003396
Short Title	Topics in Algorithms
Long Title	Topics in Algorithms
Long Descr	This course covers advanced methods of algorithmic design and analysis. Topics will be selected from: advanced data structures; amortization; persistence; optimization; approximation; randomization; probabilistic analysis; parallel algorithms.
Academic Org	Computer Science
Components	Lecture: 3.00
Requisites	Prerequisites: CPS 616
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CPS 822

Course ID 024947

Short Title Artificial Intelligence II

Long Title Artificial Intelligence II

Long Descr The course will focus on the theory and implementation of discreet dynamical systems considered from the perspective of artificial intelligence. Modern logical representations of actions and their effects will be discussed in detail. The emphasis will be on the compromises required to ensure computational tractability of reasoning about effects of actions. The course will show how these research issues are relevant to artificial intelligence and to applications beyond the traditional area of artificial intelligence. Topics may include: logical foundations, reasoning about direct and indirect effects of actions, deductive planning, time and concurrency, causality, stochastic actions, modular representations.

Academic Org Computer Science

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Prerequisite: CPS 721
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 824

Course ID 026355

Short Title Reinforcement Learning

Long Title Reinforcement Learning

Long Descr This course focuses on topics related to reinforcement learning. The course will cover making decisions under uncertainty, Markov decision processes, dynamic programming, temporal-difference learning, eligibility traces, value function approximation methods, Monte Carlo reinforcement learning methods, and the integration of learning and planning.

Academic Org Computer Science

Components Lecture: 3.00

Requisites Prerequisites: CPS 305 and (MTH 380 or MTH 304)
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1

Course Topics

CPS 831

Course ID	003295
Short Title	Software Engineering II
Long Title	Software Engineering II
Long Descr	This course is a continuation of CPS 731. Topics include: Formal specification, algebraic specification, model oriented Specification, Software reliability, fault-tolerance, Software tools, programming environments, Toolkits, Method based Environments. Software development work benches, Software reliability, Software metrics, software standards, complexity measures, Software quality assurance, automated programming, CASE Tools. (2 hr. Lab every other week).
Academic Org	Computer Science
Components	Lecture: 3.00 / Laboratory: 1.00
Requisites	Prerequisite: CPS 731
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CPS 832

Course ID 023505

Short Title Mainframe Systems

Long Title Mainframe Systems

Long Descr An overview course on mainframe hardware systems and the main operating systems running on these machines. Emphasis is on the internal system software structure of these highly complex systems, and how the hardware supports this. The course provides a comprehensive coverage of the system at several levels. After completing this course the students will have had hands-on experience in running programs and manipulating datasets on a mainframe.

Academic Org Computer Science

Components Lecture: 3.00

Requisites Prerequisites: CPS 310 and CPS 590
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 840

Course ID 000106

Short Title Sel Topics - Computer Science

Long Title Selected Topics in Computer Science

Long Descr An advanced level course taught by regular faculty members either singly, or in teams. Topics offered are determined by faculty expertise available. Registration may be limited to fourth-year students. See teaching department for consent criteria.

Academic Org Computer Science

Components Lecture: 3.00

Requisites
Equivalencies

Attributes
Dept Consent Department Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit Y
Total Completions 2
Course Topics 1. Machine Learning
2. Deep Learning

CPS 841

Course ID 004179

Short Title Adv Topics in Computer Science

Long Title Advanced Topics in Computer Science

Long Descr An in-depth analysis of recent developments and topics of current interest in Computer Science. Topics offered are determined by faculty expertise available. Registration may be limited to 4th year students. See teaching department for consent criteria.

Academic Org Computer Science

Components Lecture: 3.00 / Laboratory: 1.00

Requisites
Equivalencies

Attributes Lab Work
Dept Consent Department Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit Y
Total Completions 3
Course Topics 1. Virtual Reality
2. Machine Learning
3. Reinforcement Learning

CPS 842

Course ID 003470

Short Title Info Retrieval and Web Search

Long Title Information Retrieval and Web Search

Long Descr This course discusses basic information retrieval models, evaluation methods, state of art of search engines and new trends in web search. Topics covered include basic IR models, indexing, query operation, evaluation, categorization and clustering, web search, link analysis, web crawling, web mining, etc. After completing this course, students will have acquired the core techniques in building text retrieval systems, hands-on experience in building the core parts of a web-based search engine, and knowledge of IR applications on the world wide web.

Academic Org Computer Science

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Prerequisites: (CPS 305 and CPS 311) or (CPS 209 and CPS 305)
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 843

Course ID	005194
Short Title	Intro to Computer Vision
Long Title	Introduction to Computer Vision
Long Descr	This course describes foundational concepts of computer vision. In particular, the course covers the image formation process, image representation, feature extraction, model fitting, motion analysis, 3D parameter estimation and applications.
Academic Org	Computer Science
Components	Lecture: 3.00
Requisites	Prerequisites: [CPS 305 and MTH 108 and MTH 207 and (MTH 380 or MTH 304)] or ELE 532
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CPS 844

Course ID	002126
Short Title	Data Mining
Long Title	Data Mining
Long Descr	This course introduces the basic data mining concepts, methods, implementations, as well as applications in different areas, especially on the world wide web. Topics covered include the basic data mining techniques, data preprocessing, association rule mining, classification, clustering, web mining, and data mining application (e.g. in web personalization, recommender system, security). At the end of this course, students should be able to implement and use some of important data mining algorithms in practical applications.
Academic Org	Computer Science
Components	Lecture: 3.00 / Laboratory: 1.00
Requisites	Prerequisites: MTH 380 or MTH 304
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CPS 845

Course ID	004890
Short Title	Extreme Prog and Agile Process
Long Title	Extreme Programming and Agile Processes
Long Descr	This course presents the main principles of Extreme Programming (XP) development, including: development methodology; rules and practices; application domains; public resources, such as forums, literature, and supportive tools. Other agile methods are covered as appropriate.
Academic Org	Computer Science
Components	Lecture: 3.00 / Laboratory: 1.00
Requisites	Prerequisite: CPS 406
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CPS 847

Course ID	025676
Short Title	Software Tools for Startups
Long Title	Software Tools for Startups
Long Descr	This course will discuss core tools, frameworks, and packages used by modern startups. These areas include but are not limited to source code management, project management, databases, middleware and front-end libraries. The labs and assignments will offer hands-on experience with the software. Sample tools may include: git, ZenHub, GitOps, Terraform, Docker, Ethereum, Django, Vue, MongoDb, and QisKit.
Academic Org	Computer Science
Components	Lecture: 3.00 / Laboratory: 1.00
Requisites	Prerequisites: CPS 209
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CPS 853

Course ID	025677
Short Title	Creating Big Data Systems.
Long Title	Creating Big Data Systems.
Long Descr	This course will discuss how to build Big Data analytic and transactional systems. The course will provide introduction to the theory and practice of large-scale software systems. We will focus on defining Big Data properties and architecting the systems to accommodate these properties. In addition, we will cover quality assurance of such systems, as well as management (risk estimation, planning, team management, etc.)
Academic Org	Computer Science
Components	Lecture: 3.00 / Laboratory: 2.00
Requisites	Prerequisites: CPS406 and (CPS420 or MTH210) and (CPS510 or ITM500)
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CPS 865

Course ID	026533
Short Title	Model-Driven Software Eng.
Long Title	Model-Driven Software Engineering
Long Descr	This course discusses the foundations and technical aspects of Model-Driven Software Engineering (MDSE). Topics include: models and transformations, driving principles, application scenarios, and standards like Model-Driven Architecture (MDA), the integration of MDSE in existing development processes, and the design of domain-specific modeling languages and Model-to-Text and Model-to-Model transformations. The course also introduces tools that support the management of MDSE projects.
Academic Org	Computer Science
Components	Lecture: 3.00 / Laboratory: 1.00
Requisites	Prerequisite: CPS 406
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

CPS 870

Course ID 026534

Short Title Applied Natural Lang. Process.

Long Title Applied Natural Language Processing

Long Descr This course will examine the state-of-the-art in applied Natural Language Processing (NLP), with an emphasis on how well the algorithms work and how they can be used (or not) in applications. Topics will include POS tagging, parsing, language models and classification.

Academic Org Computer Science

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Prerequisites: (CPS 420 or MTH 210) and (MTH 380 or MTH 304)
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

CPS 888

Course ID 005040

Short Title Software Engineering

Long Title Software Engineering

Long Descr This course is for Engineering students. Topics include: Issues in software engineering; software specification; system modelling; requirements specification; validation and prototyping; formal specification; object-oriented design; function-oriented design; user-interface design; CASE; quality assurance. See teaching department for consent criteria.

Academic Org Computer Science

Components Lecture: 3.00 / Laboratory: 1.00

Requisites
Equivalencies

Attributes Lab Work
Dept Consent Department Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

WKT 103

Course ID 004213

Short Title Work Term I Computer Science

Long Title Work Term I - Computer Science

Long Descr Co-op position must be engineering or science related. Routine type of positions are acceptable. This course is graded on a pass/fail basis.

Academic Org Computer Science

Components Lecture: 1.00

Requisites
Equivalencies

Attributes Co-operative Education
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Pass/Fail
Hegis Code
GPA Weight 0.00/0.00
Billing Units 0.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

WKT 203

Course ID 005799

Short Title Work Term II Computer Science

Long Title Work Term II - Computer Science

Long Descr Co-op position must be engineering or science related. Routine type of positions are acceptable. This course is graded on a pass/fail basis.

Academic Org Computer Science

Components Lecture: 1.00

Requisites
Equivalencies

Attributes Co-operative Education
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Pass/Fail
Hegis Code
GPA Weight 0.00/0.00
Billing Units 0.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

WKT 303

Course ID 003763

Short Title Work Term III Computer Science

Long Title Work Term III - Computer Science

Long Descr Co-op position must be discipline related. Position should involve project work but some routine work is acceptable. This course is graded on a pass/fail basis.

Academic Org Computer Science

Components Lecture: 1.00

Requisites
Equivalencies

Attributes Co-operative Education
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Pass/Fail
Hegis Code
GPA Weight 0.00/0.00
Billing Units 0.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

WKT 403

Course ID 002294

Short Title Work Term IV Computer Science

Long Title Work Term IV - Computer Science

Long Descr Co-op position must be discipline related and should involve project work. This course is graded on a pass/fail basis.

Academic Org Computer Science

Components Lecture: 1.00

Requisites
Equivalencies

Attributes Co-operative Education
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Pass/Fail
Hegis Code
GPA Weight 0.00/0.00
Billing Units 0.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

WKT 503

Course ID 000007

Short Title Work Term V Computer Science

Long Title Work Term V - Computer Science

Long Descr Co-op position must be discipline related and should involve project work. This course is graded on a pass/fail basis.

Academic Org Computer Science

Components Lecture: 1.00

Requisites
Equivalencies

Attributes Co-operative Education
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Pass/Fail
Hegis Code
GPA Weight 0.00/0.00
Billing Units 0.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 40A

Course ID 022935

Short Title Thesis-A

Long Title Thesis-A

Long Descr The student will creatively apply the material learned in core courses to a significant problem. A written thesis and a public presentation are required. See teaching department for consent criteria.

Academic Org Mathematics

Components Laboratory: 3.00

Requisites
Equivalencies

Attributes Research Project
Dept Consent Department Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Multi-Term Course: Not Graded
Hegis Code
GPA Weight 0.00/0.00
Billing Units 1.0
Course Count 0.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 40B

Course ID	022936
Short Title	Thesis-B
Long Title	Thesis-B
Long Descr	The student will creatively apply the material learned in core courses to a significant problem. A written thesis and a public presentation are required.
Academic Org	Mathematics
Components	Laboratory: 3.00
Requisites	Prerequisite: MTH 40A
Equivalencies	
Attributes	Research Project
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	2.00/2.00
Billing Units	1.0
Course Count	2.0
Repeat for Credit	N
Total Completions	1
Course Topics	

MTH 108

Course ID	005660
Short Title	Linear Algebra
Long Title	Linear Algebra
Long Descr	Systems of linear equations, matrices determinants, vectors, geometry, linear transformations, linear independence, basis, dimension, eigenvalues and eigenvectors, complex numbers, applications.
Academic Org	Mathematics
Components	Lecture: 4.00 / Laboratory: 1.00
Requisites	Antirequisite: MTH 141
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

MTH 110

Course ID	003231
Short Title	Discrete Mathematics I
Long Title	Discrete Mathematics I
Long Descr	This course covers the fundamentals of discrete mathematics with a focus on proof methods. Topics include: propositional and predicate logic, notation for modern algebra, naive set theory, relations, functions and proof techniques.
Academic Org	Mathematics
Components	Lecture: 3.00 / Laboratory: 1.00
Requisites	Antirequisite: MTH 314
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

MTH 131

Course ID	010150
Short Title	Modern Mathematics I
Long Title	Modern Mathematics I
Long Descr	Limits and continuity. Differentiation with applications. Newton-Raphson method. Integration; the Fundamental Theorem of Calculus.
Academic Org	Mathematics
Components	Lecture: 3.00 / Laboratory: 1.00
Requisites	Antirequisites: MTH 140 and MTH 207
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

MTH 140

Course ID 001203

Short Title Calculus I

Long Title Calculus I

Long Descr Limits, continuity, differentiability, rules of differentiation. Absolute and relative extrema, inflection points, asymptotes, curve sketching. Applied max/min problems, related rates. Definite and indefinite integrals, Fundamental Theorem of Integral Calculus. Areas, volumes. Transcendental functions (trigonometric, logarithmic, hyperbolic and their inverses).

Academic Org Mathematics

Components Lecture: 4.00 / Laboratory: 2.00

Requisites Antirequisite: MTH 207 and MTH 131, Available only to Engineering and Engineering Special Students.

Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 140E

Course ID 001203

Short Title Calculus I

Long Title Calculus I

Long Descr Limits, continuity, differentiability, rules of differentiation. Absolute and relative extrema, inflection points, asymptotes, curve sketching. Applied max/min problems, related rates. Definite and indefinite integrals, Fundamental Theorem of Integral Calculus. Areas, volumes. Transcendental functions (trigonometric, logarithmic, hyperbolic and their inverses).

Academic Org Mathematics

Components Lecture: 4.00 / Laboratory: 2.00

Requisites Antirequisite: MTH 207 and MTH 131, Available only to Engineering and Engineering Special Students.

Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 141

Course ID	002295
Short Title	Linear Algebra
Long Title	Linear Algebra
Long Descr	Euclidean Spaces (Dot Product, Norm, Angles, Projections, Areas of Parallelograms), Matrices, Determinants, Systems of Linear Equations, Linear Transformations, Planes and Lines in the Three-Dimensional Euclidean Spaces, Bases and Dimensions, Eigenvalues and Diagonalizability, Complex Numbers, Vector Spaces, Applications.
Academic Org	Mathematics
Components	Lecture: 4.00 / Laboratory: 1.00
Requisites	Antirequisite: MTH 108; Available only to Engineering and Engineering Special students.
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

MTH 141E

Course ID 002295

Short Title Linear Algebra

Long Title Linear Algebra

Long Descr Euclidean Spaces (Dot Product, Norm, Angles, Projections, Areas of Parallelograms), Matrices, Determinants, Systems of Linear Equations, Linear Transformations, Planes and Lines in the Three-Dimensional Euclidean Spaces, Bases and Dimensions, Eigenvalues and Diagonalizability, Complex Numbers, Vector Spaces, Applications.

Academic Org Mathematics

Components Lecture: 4.00 / Laboratory: 1.00

Requisites Antirequisite: MTH 108; Available only to Engineering and Engineering Special students.

Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 207

Course ID 004124

Short Title Calc and Computatnl Methods I

Long Title Calculus and Computational Methods I

Long Descr Calculus of functions of one variable and related numerical topics. Derivatives of algebraic, trigonometric and exponential functions. Differentiation techniques and applications of derivatives. Techniques of integration.

Academic Org Mathematics

Components Lecture: 4.00 / Tutorial: 1.00

Requisites Antirequisite: MTH 140 and MTH 131
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 210

Course ID 002372

Short Title Discrete Mathematics II

Long Title Discrete Mathematics II

Long Descr This course is a continuation of Discrete Mathematics I. Topics include: recursion, induction, introduction to number theory including modular arithmetic and graph theory (time permitting).

Academic Org Mathematics

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Prerequisite: MTH 110; Antirequisite: CPS 420
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 231

Course ID 010290

Short Title Modern Mathematics II

Long Title Modern Mathematics II

Long Descr Implicit functions and differentiation. Related rates, concavity, inflection points and asymptotics. Optimization. L'Hôpital's rule. Applications of integration. Techniques of integration. Vectors: geometric and analytic descriptions; dot product, orthogonality and projection; cross product; lines and planes in 3-space.

Academic Org Mathematics

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Prerequisite: MTH 131; Antirequisite: MTH 310 and MTH 240
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 240

Course ID 001963

Short Title Calculus II

Long Title Calculus II

Long Descr Integration techniques. L'Hôpital's Rule. Improper integrals. Partial derivatives. Infinite sequences and series, power series. First-order differential equations, with applications.

Academic Org Mathematics

Components Lecture: 4.00 / Laboratory: 1.00

Requisites Prerequisite: MTH 140; Antirequisite: MTH 310 and MTH 231; Available only to Engineering and Engineering Special Students.

Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 240E

Course ID 001963

Short Title Calculus II

Long Title Calculus II

Long Descr Integration techniques. L'Hôpital's Rule. Improper integrals. Partial derivatives. Infinite sequences and series, power series. First-order differential equations, with applications.

Academic Org Mathematics

Components Lecture: 4.00 / Laboratory: 1.00

Requisites Prerequisite: MTH 140; Antirequisite: MTH 310 and MTH 231; Available only to Engineering and Engineering Special Students.

Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 260

Course ID	026311
Short Title	Intro to Mathematical Inquiry
Long Title	Introduction to Mathematical Inquiry
Long Descr	This course is about proof methodologies and mathematical writing motivated by concepts covered in the prerequisites with a focus on recognizing and writing rigorous mathematical proofs. Topics used as a vehicle for proof writing include set theory, number theory, and analysis. Special emphasis is placed on epsilon-delta proofs.
Academic Org	Mathematics
Components	Lecture: 3.00
Requisites	Prerequisite: MTH 110
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

MTH 304

Course ID	002815
Short Title	Probability
Long Title	Probability
Long Descr	Topics include: Elements of Probability Theory. Discrete Probability Distribution. (Hyper-geometric, Binomial, Poisson). Normal Distribution and its applications. Lognormal Distribution, Multivariate Distributions, Covariance and Correlation, Moment Generating Functions, Central limit theorem and applications. A statistics computer package will be used in this course.
Academic Org	Mathematics
Components	Lecture: 3.00 / Laboratory: 1.00
Requisites	Prerequisites: MTH 310 or MTH 240 or MTH 231; Antirequisite: MTH 410 and MTH 380
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

MTH 310

Course ID 002351

Short Title Calc and Computatnl Mthds II

Long Title Calculus and Computational Methods II

Long Descr Integration techniques, improper integrals, sequences, infinite series, power series. Taylor series, Taylor polynomials. Applications to topics in differential equations, numerical techniques and probability theory as time permits.

Academic Org Mathematics

Components Lecture: 4.00 / Tutorial: 1.00

Requisites Prerequisite: MTH 207; Antirequisites: MTH 240 and MTH 231
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 312

Course ID 005442

Short Title Diff Equat and Vector Calculus

Long Title Differential Equations and Vector Calculus

Long Descr Second and higher order differential equations with Laplace Transforms, systems of differential equations, Fourier series and applications to electric circuits. Directional derivative. Line, surface and volume integrals. Green's theorem, Stoke's theorem and divergence theorem. Vector fields, coordinate systems.

Academic Org Mathematics

Components Lecture: 4.00 / Laboratory: 1.00

Requisites Prerequisites: MTH 141 and MTH 240; Antirequisite: MTH 425, MTH 430 and MTH 330
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 312E

Course ID	005442
Short Title	Diff Equat and Vector Calculus
Long Title	Differential Equations and Vector Calculus
Long Descr	Second and higher order differential equations with Laplace Transforms, systems of differential equations, Fourier series and applications to electric circuits. Directional derivative. Line, surface and volume integrals. Green's theorem, Stoke's theorem and divergence theorem. Vector fields, coordinate systems.
Academic Org	Mathematics
Components	Lecture: 4.00 / Laboratory: 1.00
Requisites	Prerequisites: MTH 141 and MTH 240; Antirequisite: MTH 425, MTH 430 and MTH 330
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

MTH 314

Course ID	005830
Short Title	Discrete Math for Engineers
Long Title	Discrete Mathematics for Engineers
Long Descr	Sets and relations, proposition and predicate logic, functions and sequences, elementary number theory, mathematical reasoning, combinatorics, graphs and trees, finite-state machines, Boolean algebra.
Academic Org	Mathematics
Components	Lecture: 3.00
Requisites	Prerequisites: MTH 141 and MTH 240; Antirequisite: MTH 110
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

MTH 314E

Course ID 005830

Short Title Discrete Math for Engineers

Long Title Discrete Mathematics for Engineers

Long Descr Sets and relations, proposition and predicate logic, functions and sequences, elementary number theory, mathematical reasoning, combinatorics, graphs and trees, finite-state machines, Boolean algebra.

Academic Org Mathematics

Components Lecture: 3.00

Requisites Prerequisites: MTH 141 and MTH 240; Antirequisite: MTH 110
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 322

Course ID 010276

Short Title Chaos, Fractals and Dynamics

Long Title Chaos, Fractals and Dynamics

Long Descr Fractals; drawing fractals, fractal dimension, Julia sets. Discrete dynamical systems; Logistic equation, period-doubling bifurcations. The Henon map. Nonlinear ordinary differential equations; phase portraits, stability, periodic orbits, averaging methods and bifurcations. Nonlinear oscillations.

Academic Org Mathematics

Components Lecture: 3.00

Requisites Prerequisite: (MTH 231 or MTH 310 or MTH 240) and (MTH 108 or MTH 141)
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 330

Course ID 010275

Short Title Calculus and Geometry

Long Title Calculus and Geometry

Long Descr Derivatives and the chain rule. Multiple integrals, curves and surfaces in 3-space. Div, grad and curl operators, line and surface integrals, theorems of Green, Gauss and Stokes. Linear Algebra: linear transformations, matrix representations and change of coordinates.

Academic Org Mathematics

Components Lecture: 4.00 / Tutorial: 1.00

Requisites Prerequisites: MTH 231 or MTH 310 or MTH 240 or ECN 230; Antirequisites: MTH 312 and MTH 425

Equivalencies MTH330/MTH505

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 380

Course ID 001747

Short Title Probability and Statistics I

Long Title Probability and Statistics I

Long Descr Probability and Statistics I: Descriptive statistics. Probability (Laws of probability. Conditional probability. Discrete probability distributions (binomial, hypergeometric, Poisson). Continuous probability distributions, Normal, t-exponential, x^2. Applications of discrete and continuous distributions. Sampling distributions (sample mean, sample proportion, difference between two samples, difference between two sample proportions). Sampling distribution concerning mean variance and proportion for one or two populations. Estimation for large and small samples. Hypothesis testing concerning mean, variance and proportion for one or two populations, (large samples and small samples) including paired data testing.

Academic Org Mathematics

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Prerequisites: MTH 131 or MTH 207; Antirequisites: MTH 410 and MTH 304

Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1

Course Topics

MTH 404

Course ID	005420
Short Title	Statistics
Long Title	Statistics
Long Descr	Sampling probability distributions (t-student, Chi-squared and F-Fisher distribution). Point estimation. Maximum Likelihood estimation. Estimation by confidence intervals. Hypothesis testing. ANOVA one- and two-way. Simple linear regression models; multiple regression analysis including variable selection techniques; regression diagnostics. Non-linear regression. Goodness of fit test. A statistics computer package will be used in this course.
Academic Org	Mathematics
Components	Lecture: 3.00 / Laboratory: 1.00
Requisites	Prerequisite: MTH 304 or MTH 380; Antirequisite: MTH 410 and MTH 480
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

MTH 410

Course ID 004798

Short Title Statistics

Long Title Statistics

Long Descr Statistics: Description of numerical data. Elements of probability theory. Discrete probability distributions (hypergeometric, binomial, geometric and Poisson distribution). Continuous probability distributions; uniform on an interval, Normal distribution, t-distribution, Exponential distribution, x^2 distribution. Confidence interval and hypothesis testing concerning mean, variance and proportion for one and two populations. F-distribution. Correlation. Simple linear regression (if time permits).

Academic Org Mathematics

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Prerequisites: MTH 141 and MTH 240; Antirequisite: MTH 304, MTH 380 and MTH 404
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 410E

Course ID 004798

Short Title Statistics

Long Title Statistics

Long Descr Statistics: Description of numerical data. Elements of probability theory. Discrete probability distributions (hypergeometric, binomial, geometric and Poisson distribution). Continuous probability distributions; uniform on an interval, Normal distribution, t-distribution, Exponential distribution, x^2 distribution. Confidence interval and hypothesis testing concerning mean, variance and proportion for one and two populations. F-distribution. Correlation. Simple linear regression (if time permits).

Academic Org Mathematics

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Prerequisites: MTH 141 and MTH 240; Antirequisite: MTH 304, MTH 380 and MTH 404
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 425

Course ID	022869
Short Title	Diff Equat and Vector Calculus
Long Title	Differential Equations and Vector Calculus
Long Descr	Review of first-order ordinary differential equations and applications; Higher-order linear differential equations; Laplace Transforms and ODEs. Scalar and vector functions and fields, Directional Derivative, coordinate systems, divergence and curl of vector fields; line, surface and multiple integrals, Divergence theorem; Green's and Stokes' theorems; Applications.
Academic Org	Mathematics
Components	Lecture: 4.00 / Laboratory: 2.00
Requisites	Prerequisites: MTH 140 and MTH 141 and MTH 240; Antirequisites: MTH 312, MTH 330 and MTH 430
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

MTH 425E

Course ID 022869

Short Title Diff Equat and Vector Calculus

Long Title Differential Equations and Vector Calculus

Long Descr Review of first-order ordinary differential equations and applications; Higher-order linear differential equations; Laplace Transforms and ODEs. Scalar and vector functions and fields, Directional Derivative, coordinate systems, divergence and curl of vector fields; line, surface and multiple integrals, Divergence theorem; Green's and Stokes' theorems; Applications.

Academic Org Mathematics

Components Lecture: 4.00 / Laboratory: 2.00

Requisites Prerequisites: MTH 140 and MTH 141 and MTH 240; Antirequisites: MTH 312, MTH 330 and MTH 430

Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 430

Course ID 010179

Short Title Dynamic Sys Diff Equations

Long Title Dynamic Systems Differential Equations

Long Descr First-order differential equations, first order systems, linear systems; numerical methods and applications. Non-linear systems, discrete dynamical systems. Linear Algebra; Eigenvalues and eigenvectors.

Academic Org Mathematics

Components Lecture: 4.00 / Tutorial: 1.00

Requisites Prerequisites: (MTH 108 and (MTH 231 OR MTH 310)) or ECN 230; Antirequisite: MTH 312 and MTH 425

Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 480

Course ID 004640

Short Title Probability and Statistics II

Long Title Probability and Statistics II

Long Descr A continuation of the introductory topics covered in MTH 380. ANOVA One and two-way. Correlation. Regression. Contingency Tables. Goodness of fit tests. A statistics computer package will be used in this course.

Academic Org Mathematics

Components Lecture: 3.00

Requisites Prerequisite: MTH 380; Antirequisite: MTH 404
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 500

Course ID 010234

Short Title Intro to Stochastic Processes

Long Title Introduction to Stochastic Processes

Long Descr Topics include: Conditional expectation. Markov chains. Poisson process and Compound Poisson process. Continuous-time Markov processes. Discrete-time martingales. Continuous-time martingales. Brownian motion. Stochastic integration and introduction to stochastic differential equations.

Academic Org Mathematics

Components Lecture: 3.00

Requisites Prerequisite: MTH 304 or MTH 480 or ECN 702
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 501

Course ID 005758

Short Title Numerical Analysis I

Long Title Numerical Analysis I

Long Descr Errors and floating point arithmetic. Solutions of non-linear equations including fixed point iteration. Matrix computations and solutions of systems of linear equations. Interpolation. Finite difference methods. Least squares fit. Cubic spline interpolation. Numerical integration. Numerical solution of ordinary differential equations. Taylor series method. Euler method.

Academic Org Mathematics

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Prerequisite: ECN 230 or (MTH 231 and MTH 108) or (MTH 310 and MTH 108); Antirequisite: MTH 510

Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 503

Course ID 004782

Short Title Intro Linear Programming

Long Title Intro Linear Programming and Applications

Long Descr Linear Programming Formulations, Simplex Algorithm, Weak and Strong Duality, Complementary Slackness Conditions, Primal-Dual Algorithms, Applications, Integer Programming Formulations, Cutting Planes, Branch-and-Bound.

Academic Org Mathematics

Components Lecture: 3.00

Requisites Prerequisites: (MTH 108 or MTH 141) and (MTH 231 or MTH 240 or MTH 310)

Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 510

Course ID 005032

Short Title Numerical Analysis

Long Title Numerical Analysis

Long Descr Review of Taylor's formula, truncation error and round off error. Solutions of Non linear Equations in one variable. Linear Equations. LU-decomposition. Eigenvalues and eigenvectors. Jacobi, Gauss-Seidel methods. Interpolation and curve fitting. Numerical integration. Numerical solution of ordinary differential equations. (Initial value problems.)

Academic Org Mathematics

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Prerequisites: MTH 141 and MTH 240; Antirequisite: MTH 501

Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 511

Course ID 022351

Short Title Limitations of Measurement

Long Title Limitations of Measurement

Long Descr Measurements are made to make a judgment about something. It can be to judge the accuracy of data, to accept or reject a product or to determine the price charged in everyday commerce. The judgment made can only be as sound as the measurement is reliable. The error in making a measurement limits its usefulness. This course will introduce basic concepts associated with measurement and the uncertainty in measurement, including the source of error in measurement. Examples taken from the physical, biological and medical sciences will illustrate how the limitations of measurements can alter people's perceptions and the impact this can have on issues such as government policies and medical treatments. (Formerly SCI 500)

Academic Org Mathematics

Components Lecture: 3.00

Requisites Not available to Faculty of Engineering and Architecture Students (with the exception of Architecture) nor Faculty of Science Students.

Equivalencies

Attributes Upper Level Liberal Studies
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N

Total Completions 1
Course Topics

MTH 514

Course ID	004893
Short Title	Prob and Stochastic Processes
Long Title	Probability and Stochastic Processes
Long Descr	Introduction to probability theory and stochastic processes. Topics covered include: elements of probability theory, conditional probability sequential experiments, random variables and random vectors, probability density, function cumulative density functions, functions of random variables, expected values of random variables, transform methods in random variable, reliability of systems, joint and marginal probability, correlation, confidence intervals, stochastic processes, stationary and ergodic processes, power spectral density, sample processes.
Academic Org	Mathematics
Components	Lecture: 3.00 / Laboratory: 1.00
Requisites	Prerequisites: MTH 312
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

MTH 525

Course ID	022921
Short Title	Analysis
Long Title	Analysis
Long Descr	Axioms of the real number system. Elementary point topology. Sequences and series of numbers. Limits and Continuity. Differentiation and Taylor's theorem. Sequences and Series of functions. Introduction to Riemann integration. Implicit and inverse function theorems and applications.
Academic Org	Mathematics
Components	Lecture: 3.00 / Laboratory: 1.00
Requisites	Prerequisite: (MTH 210 or CPS 420) and MTH 260
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

MTH 540

Course ID	000855
Short Title	Geometry
Long Title	Geometry
Long Descr	Projective plane and 3-space. Cross-ratio, perspectivity, conics and quadrics, poles and polars. Line geometry in projective 3-space. Euclidean, elliptic and hyperbolic interpretation of projective results. Inversive geometry and the complex projective line. Classification of motions in the Euclidean, elliptic, Gaussian and hyperbolic cases.
Academic Org	Mathematics
Components	Lecture: 3.00
Requisites	Prerequisite: MTH 108 or MTH 141
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

MTH 560

Course ID 024616

Short Title Problem Solving

Long Title Problem Solving

Long Descr Introduction to techniques in problems solving; heuristics of problem solving; direct proof and proof by contradiction; problems in elementary number theory; principle of mathematical induction and the pigeonhole principle; zeros of polynomials; inequalities.

Academic Org Mathematics

Components Lecture: 3.00

Requisites Prerequisite: MTH 210 or CPS 420
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 599

Course ID 004724

Short Title Foundations of Math Thought

Long Title Foundations of Mathematical Thought

Long Descr A one semester course on the nature of mathematical thought. Mathematics is commonly believed to enjoy a degree of certainty which sets it apart from other disciplines. Moreover, this certainty is often confused with veracity, and a science gains respectability as its quantitative component increases. This course will explore the nature and extent of this certainty in mathematics. There are no specific pre-requisites but a previous course in Philosophy or other course requiring logical reasoning is recommended.

Academic Org Mathematics

Components Lecture: 3.00

Requisites Not available to Faculty of Engineering and Architecture nor Faculty of Science Students with the exception of Architecture.
Equivalencies

Attributes Upper Level Liberal Studies
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 600

Course ID	024617
Short Title	Computational Methods in Math
Long Title	Computational Methods in Mathematics
Long Descr	Topics include: Statistical simulation of random variables and stochastic differential equations. Numerical solutions for partial differential equations, finite differences and finite-element methods. Optimization methods: linear programming, the simplex method and non-linear programming. The Matlab software will be used in assignments as a numeric and symbolic tool.
Academic Org	Mathematics
Components	Lecture: 3.00 / Laboratory: 1.00
Requisites	Prerequisite: MTH 500 and (MTH 501 or MTH 510)
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

MTH 601

Course ID 001372

Short Title Numerical Analysis II

Long Title Numerical Analysis II

Long Descr Numerical solutions for initial value and boundary value problems for ordinary differential equations. Runge-Kutta, Multi-step, Hybrid methods. Convergence criteria. Error analysis aspects. Shooting, finite- difference, Rayleigh-Ritz methods. Matrix eigenvalue problem. Jacobi, Givens, Householder, Power methods. Numerical double interpolation and multiple integration. Non-linear systems of equations. Numerical solutions to partial differential equations. This course will include laboratory classes using electronic calculators and computer terminals.

Academic Org Mathematics

Components Lecture: 4.00

Requisites Prerequisites: MTH 501 or MTH 510
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 603

Course ID 001266

Short Title Non-Linear Programming

Long Title Non-Linear Programming and Applications

Long Descr Quadratic Optimization, Non-Linear Optimization, Optimality Conditions, KarushKuhnTucker Theorem, Numerical Methods (Descent Direction, Newton's), Portfolio Optimization, Markowitz Efficient Frontier, Capital Market Line, Sharpe Ratio.

Academic Org Mathematics

Components Lecture: 3.00

Requisites Prerequisite: (MTH 108 or MTH 141) and (MTH 231 or MTH 240 or MTH 310)
Equivalencies CKMT603/MTH603

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 607

Course ID	004357
Short Title	Graph Theory
Long Title	Graph Theory
Long Descr	Introduction to graph theory and its applications with an emphasis on algorithmic structure. Topics may include graphs, digraphs and subgraphs, representation of graphs, breadth first and depth first search, connectivity, paths, trees, circuits and cycles, planar graphs flows and networks, matchings, colourings, hypergraphs, intractability and random algorithms.
Academic Org	Mathematics
Components	Lecture: 3.00 / Tutorial: 1.00
Requisites	Prerequisite: MTH 110
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

MTH 609

Course ID 004718

Short Title Number Theory

Long Title Number Theory

Long Descr Division Algorithm, The greatest common divisor, Euclidean Algorithm and Diophantine Equations; Prime numbers and Fundamental Theorem of arithmetic; The theory of congruences; Linear congruences and The Chinese Remainder Theorem; Special congruences: Fermat's little theorem, Wilson's theorem; Euler's Phi-function and Euler's generalization of Fermat's little theorem; Applications: RSA cryptosystem; Legendre's symbol and its properties; Euler's criterion; Quadratic reciprocity law; Some nonlinear Diophantine equations; Representation of integers as sums of squares.

Academic Org Mathematics

Components Lecture: 3.00

Requisites Prerequisite: (MTH 108 or MTH 141) and (MTH 210 or CPS 420)
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 617

Course ID 022922

Short Title Algebra

Long Title Algebra

Long Descr Sets; Binary operations; functions; partitions and equivalence relations; definition and examples of groups; elementary properties of groups; order of group elements; properties of the order of group elements; cyclic groups; subgroups, counting cosets and Lagrange's theorem; homomorphisms; quotient groups; the fundamental homomorphism theorem and its consequences; Definition and elementary properties of rings; integral domains.

Academic Org Mathematics

Components Lecture: 3.00 / Tutorial: 1.00

Requisites Prerequisite: MTH 210 or CPS 420
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 630

Course ID	024618
Short Title	Mathematical Biology
Long Title	Mathematical Biology
Long Descr	Linear differential equations, Routh-Hurwitz criteria, first-order systems. Local stability in the first-order nonlinear systems, phase-plane analysis, periodic solutions, bifurcations, global stability, Liapunov functions, persistence and extinction theory. Harvesting a single population, predator-prey models, competition models, spruce budworm models, chemostat models, epidemic models, Hodgkin-Huxley, Fitzhugh-Nagumo models and/or models of molecular events.
Academic Org	Mathematics
Components	Lecture: 3.00
Requisites	Prerequisites: (MTH 231 or MTH 310 or MTH 240) and (MTH 430 or MTH 309 or MTH 425 or MTH 312) and (MTH 108 or MTH 141)
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

MTH 640

Course ID	004559
Short Title	Complex Analysis
Long Title	Complex Analysis
Long Descr	Arithmetic of Complex numbers. DeMoivre's theorem. Roots and Powers of complex numbers. Functions of a complex variable. Limits and continuity. Cauchy-Riemann equations. Exponential, trigonometric, hyperbolic and logarithmic functions. Analytic functions. Integration in the complex plane. Residue theorem. Applications.
Academic Org	Mathematics
Components	Lecture: 3.00 / Tutorial: 1.00
Requisites	Prerequisites: MTH 312 or MTH 330 or MTH 425
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

MTH 642

Course ID	025198
Short Title	Data Analytics: Adv. Methods
Long Title	Data Analytics: Advanced Methods
Long Descr	This course builds on the previous Basic Methods course and covers more advanced concepts including classification and clustering algorithms, decision trees, linear and logistic regression, time series analysis, and text analytics. The course will provide applied knowledge on how to analyze large scale network data produced through social media. In this context topics include network community detection, techniques for link analysis, information propagation on the web and information analysis of social media.
Academic Org	Mathematics
Components	Lecture: 3.00
Requisites	Prerequisites: (IND 119, IND 123 and IND 830) or [(MTH 304 or MTH 380) and (CPS 109 or CPS 106 or CPS 118)]
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

MTH 655

Course ID	026308
Short Title	Machine Learning in Business
Long Title	Machine Learning in Business
Long Descr	This course covers the most recent technological innovations in business. Topics include: supervised learning, unsupervised learning, reinforcement learning, adaptive neuro-fuzzy inference systems. Applications include: digital money, blockchain technology (cryptocurrencies), natural language processing, credit decisions, interest rate modelling, price prediction, risk management.
Academic Org	Mathematics
Components	Lecture: 3.00
Requisites	Prerequisites: MTH 304 and MTH 330 and (CPS 118 or CPS 106 or CPS 109)
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

MTH 660

Course ID 026309

Short Title Fixed Income Modelling

Long Title Fixed Income Modelling

Long Descr This course develops and studies techniques and models that are used in the analysis of fixed income securities. Topics include: extracting yield curves from bond prices, economics of the term structure of interest rates, types of fixed income securities, one- and multi-factor diffusion models, Heath-Jarrow-Morton models, measurement and management of interest rate risk, defaultable bonds and credit derivatives and stock and currency derivatives when interest rates are stochastic.

Academic Org Mathematics

Components Lecture: 3.00

Requisites Prerequisites: MTH 430, MTH 500 and (CPS 118 or CPS 106 or CPS109)
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 665

Course ID 026310

Short Title Mathematical Game Theory

Long Title Mathematical Game Theory

Long Descr Games and solution concepts, Nash's theorem, Lemke-Howson algorithm, extensive games, stochastic repeated game Bayesian games, coalition games combinatorial games, network games and quality of equilibria, mechanism design, elections and arrow's theorem.

Academic Org Mathematics

Components Lecture: 3.00

Requisites Prerequisites: MTH 210, MTH 108 and MTH 304
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 700

Course ID	024619
Short Title	Financial Mathematics I
Long Title	Financial Mathematics I
Long Descr	Topics include: Introduction to the fundamental topics in financial mathematics including fixed income instruments and derivative pricing. Stochastic calculus, martingales and Ito's formula are the main modeling tools used in the course. Pricing and hedging for a wide range of option contracts and future derivatives are developed for several models and by means of analytical and numerical techniques.
Academic Org	Mathematics
Components	Lecture: 3.00 / Laboratory: 1.00
Requisites	Prerequisite: MTH 500
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

MTH 707

Course ID	024620
Short Title	Modelling/Searching Networks
Long Title	Modelling and Searching Networks
Long Descr	Review of graph theory. Binomial random graph model. First and second moment method; martingales. Overview of models such as preferential attachment, ranking, geometric, and copying models. Introduction to graph searching. Topics from graph searching such as Cops and Robbers games, graph cleaning, Seepage, and firefighting.
Academic Org	Mathematics
Components	Lecture: 3.00
Requisites	Prerequisites: MTH 607 and (MTH 380 or MTH 304 or MTH 410)
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

MTH 710

Course ID 003001

Short Title Fourier Analysis

Long Title Fourier Analysis

Long Descr An advanced course in Fourier Methods dealing with the application of Fourier series, Fourier transforms, convolution, correlation, discrete and fast Fourier transforms. Continuous and discrete signal representation and processing.

Academic Org Mathematics

Components Lecture: 3.00

Requisites Prerequisites: (MTH 108 or MTH 141) and (MTH 231 or MTH 310 or MTH 240)
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 712

Course ID 005296

Short Title Partial Differential Equations

Long Title Partial Differential Equations

Long Descr Topics include: Overview of modeling with partial differential equations; boundary value problems of applied mathematics including such partial differential equations as the heat equation, Laplace's equation and the Helmholtz equation. Sturm-Liouville theory and Green's formula. Techniques will include separation of variables, canonical transformations and integral transform methods.

Academic Org Mathematics

Components Lecture: 3.00

Requisites Prerequisite: (MTH 309 or MTH 430) and (MTH 330)
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 714

Course ID 001590

Short Title Logic and Computability

Long Title Logic and Computability

Long Descr Propositional and predicate calculus, first order theories, undecidability. Resolution and Horn clauses, logic programming (Prolog). Effective computability and halting problem. Applications of logic to problems in computability.

Academic Org Mathematics

Components Lecture: 3.00 / Tutorial: 1.00

Requisites Prerequisites: MTH 110 or MTH 314
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 718

Course ID 001041

Short Title Design and Codes

Long Title Design and Codes

Long Descr Students will learn the basics of design theory, with particular emphasis on error correcting and detecting codes. Such codes are widely used in network communications. The student will also be exposed to other applications of design such as scheduling and routing problems.

Academic Org Mathematics

Components Lecture: 3.00

Requisites Prerequisite: MTH 110 or MTH 314
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 719

Course ID	023509
Short Title	Applied Linear Algebra
Long Title	Applied Linear Algebra
Long Descr	Emphasis on the interplay between theory, application and numerical techniques. Review of vector spaces, complexity of algorithms and numerical techniques, applications of eigenvalues and eigenvectors. Singular value decomposition. Markov chains and probability matrices. Linear Transformations. Inner product spaces. Concepts will be illustrated through applications as chosen by the instructor. Lab work done with an appropriate software package.
Academic Org	Mathematics
Components	Lecture: 3.00 / Laboratory: 1.00
Requisites	Prerequisite: (MTH 131 or MTH 207 or MTH 140) and (MTH 108 or MTH 141) and (CPS 118 or CPS 109 or CPS 106 or CPS 125)
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

MTH 732

Course ID	024621
Short Title	Introduction to Fluid Dynamics
Long Title	Introduction to Fluid Dynamics
Long Descr	We derive equations governing fluid flows from the basic physical conservation laws. Exact analytic solutions to various elementary flow problems are obtained. We consider viscous flow, irrotational flow, boundary layers and water waves. Flow instability will also be examined. Mathematical results are related to phenomena observed in aerodynamics, flow through conduits and geophysical flows.
Academic Org	Mathematics
Components	Lecture: 3.00
Requisites	Prerequisite: MTH 330 and MTH 712
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

MTH 800

Course ID	024622
Short Title	Financial Mathematics II
Long Title	Financial Mathematics II
Long Descr	This course covers fixed income derivatives and the quantitative aspects of risk and portfolio management in modern finance. It introduces single factor interest rate models and pricing and covers analysis of risk measures and their properties, market, credit risk and an overview of other types of risks. The course also develops portfolio optimization techniques. Case studies and preparation for financial certification programs (FRM and PRM) are also included.
Academic Org	Mathematics
Components	Lecture: 3.00 / Laboratory: 1.00
Requisites	Prerequisite: MTH 700
Equivalencies	
Attributes	Case Studies, Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

MTH 810

Course ID 025549

Short Title Selected Topics in Mathematics

Long Title Selected Topics in Mathematics

Long Descr An advanced level course taught by regular faculty members from the department. Topics offered are determined by faculty expertise available. Registration may be limited to fourth-year students. See teaching department for consent criteria.

Academic Org Mathematics

Components Lecture: 3.00

Requisites
Equivalencies

Attributes
Dept Consent Department Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit Y
Total Completions 2
Course Topics

MTH 814

Course ID 004562

Short Title Computational Complexity

Long Title Computational Complexity

Long Descr Order of Growth notation, time and space complexities of DTMs and NDTMs, intractability, basic complexity classes, P=NP?, reducibility and completeness, NP-completeness, Cook's theorem, hierarchy results, circuit complexity, probabilistic algorithms, models for parallel computation.

Academic Org Mathematics

Components Lecture: 3.00

Requisites Prerequisite: MTH 110 or MTH 314
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 816

Course ID 004304

Short Title Cryptography

Long Title Cryptography

Long Descr This course will consider the mathematics of modern cryptographic schemes, including commonly used public and private key systems. The main uses; authentication, validation and encryption will be discussed. System vulnerabilities will also be considered.

Academic Org Mathematics

Components Lecture: 3.00

Requisites Prerequisite: MTH 110 or MTH 314
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 817

Course ID 003202

Short Title Combinatorics

Long Title Combinatorics

Long Descr Elementary principles of counting, partitions, and applications. Generating functions, recurrence equations. Groups of permutations and their applications to counting. Designs and matroids.

Academic Org Mathematics

Components Lecture: 3.00

Requisites Prerequisites: (MTH 108 or MTH 141) and (MTH 231 or MTH 207 or MTH 140)
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 818

Course ID 024623

Short Title Topics in Algebra

Long Title Topics in Algebra

Long Descr Permutation groups, group actions and applications in combinatorics. Commutative rings, polynomial rings, and finite fields. Basic concepts and the Fundamental Theorem of Galois theory. Finite and infinite Abelian groups and decomposition theorems. Modules. Rings with chain conditions. Advanced topics in linear algebra, canonical forms.

Academic Org Mathematics

Components Lecture: 3.00

Requisites Prerequisite: MTH 617

Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 820

Course ID 010160

Short Title Image Analysis

Long Title Image Analysis

Long Descr Continuous and discrete image representation. Sampling and reconstruction. Quantization. Spatial domain and intensity transformations. Convolution. Image enhancement/restoration. Edge detection, feature extraction, segmentation, registration.

Academic Org Mathematics

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Prerequisites: (MTH 108 or MTH 141) and (MTH 231 or MTH 310 or MTH 240); Antirequisite: CPS 843

Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

MTH 825

Course ID	024624
Short Title	Topics in Analysis
Long Title	Topics in Analysis
Long Descr	Vector and normed spaces; Spaces of continuous functions and bounded variation. Banach spaces; Functions of bounded variations and their characterizations; Riemann-Stieljes integral and the Riemann integral; Riesz's representation theorem.
Academic Org	Mathematics
Components	Lecture: 3.00
Requisites	Prerequisite: MTH 525
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

PCS 40A

Course ID	021827
Short Title	Medical Physics - Thesis-A
Long Title	Medical Physics - Thesis-A
Long Descr	A laboratory or theoretical research project in medical physics or related topics under the supervision of a faculty member. A thesis document is required. Students must be in the 4th year of the Medical Physics program to register in this course. A student may petition the Course Coordinator to have this required course replaced by two other courses to be chosen in consultation with the Program Director.
Academic Org	Physics
Components	Lecture: 3.00
Requisites	
Equivalencies	
Attributes	Lab Work, Research Project
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Multi-Term Course: Not Graded
Hegis Code	
GPA Weight	0.00/0.00
Billing Units	1.0
Course Count	0.0
Repeat for Credit	N
Total Completions	1
Course Topics	

PCS 40B

Course ID 021828

Short Title Medical Physics - Thesis-B

Long Title Medical Physics - Thesis-B

Long Descr A laboratory or theoretical research project in medical physics or related topics under the supervision of a faculty member. A thesis document is required. Students must be in the 4th year of the Medical Physics program to register in this course. A student may petition the Course Coordinator to have this required course replaced by two other courses to be chosen in consultation with the Program Director.

Academic Org Physics

Components Lecture: 3.00

Requisites Prerequisite: PCS 40A
Equivalencies

Attributes Lab Work, Research Project
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 2.00/2.00
Billing Units 1.0
Course Count 2.0
Repeat for Credit N
Total Completions 1
Course Topics

PCS 102

Course ID 010263

Short Title Physics Ansrs Evrydy Questions

Long Title Physics Answers to Everyday Questions

Long Descr The physics of everyday life course is for liberal arts students who are looking to understand a connection between science and the world in which they live. This course offers a non-conventional view of physics and science that starts with whole objects and looks inside them to see what makes them work. What really keeps an airplane up? What is the sound barrier made of? Why does your shower curtain cling to you? Are smoke alarms radioactive? (May not be used as a credit towards a science degree) (Formerly SCI 104).

Academic Org Physics

Components Lecture: 3.00

Requisites Antirequisites: PCS 120, PCS 130; Not available to Faculty of Engineering and Architectural Science students nor to Faculty of Science students.
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

PCS 106

Course ID	001434
Short Title	Physics for Health Sciences
Long Title	Physics for the Health Sciences
Long Descr	An introduction to the physical ideas related to the fields of environmental and occupational health; mechanics, work/energy, fluids, sound, thermodynamics, basic electricity, the electromagnetic spectrum and nuclear quantities.
Academic Org	Physics
Components	Lecture: 3.00 / Tutorial: 0.50 / Laboratory: 0.50
Requisites	Not available to Faculty of Engineering and Architectural Science students nor to Faculty of Science students.
Equivalencies	PCS162/PCS106
Attributes	Case Studies, Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	CNED3
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

PCS 107

Course ID 022370

Short Title The Natural Context

Long Title The Natural Context

Long Descr This course offers an introduction to the application of basic physical concepts and processes in the physical world to the built environment. Basic concepts of physics are introduced in the context of the building project: gravitation, fluid mechanics, heat transfer, waves, and properties of materials. Structural concepts of applied loads balanced by structural resistance are also considered. The concept of natural versus controlled environments is introduced and implications are discussed.

Academic Org Physics

Components Lecture: 3.00

Requisites Not available to Faculty of Engineering and Architecture Students (with the exception of Architectural Science Program) nor to Faculty of Science Students.

Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

PCS 110

Course ID 005299

Short Title Physics

Long Title Physics

Long Descr Units and vectors. Motion: linear, projectile, circular and oscillatory motion. Newton's laws: Force, mass and acceleration; work, energy and power; linear and angular momentum. Electrostatics: Electric force and field; potential and potential energy; capacitance. Electric current and DC circuits. Magnetic field and force: magnetic force on currents and charges; Hall effect; torque on current loops; Waves: classification of waves; energy transfer; light and electromagnetic waves; diffraction and interference. MAPLE used for simulation/visualization of physical phenomena and problem solving.

Academic Org Physics

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Not available to Faculty of Engineering and Architectural Science students nor to Faculty of Science students (with the exception of Computer Science Program).

Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0

Repeat for Credit N
Total Completions 1
Course Topics

PCS 111

Course ID 024957

Short Title Physics in the News

Long Title Physics in the News

Long Descr A presentation of important scientific topics to equip non-science students with tools to understand technical issues that affect humanity. The course content may include topics such as energy, global climate, space-travel, high-tech devices, national security and weapons systems which are introduced at a conceptual level and discussed in an accessible style with emphasis on critical analysis of contemporary sources. Topics covered may vary from year to year to reflect emerging issues and new developments.

Academic Org Physics

Components Lecture: 3.00

Requisites Not available to Faculty of Engineering and Architecture Students (with the exception of Architecture) nor Faculty of Science Students.

Equivalencies

Attributes Lower Level Liberal Studies
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

PCS 120

Course ID 010149

Short Title Physics I

Long Title Physics I

Long Descr A calculus based course covering fundamental physics concepts: units, vectors, linear motion, circular motion, force and motion, work and energy, collisions, gravitation, electrostatics, capacitance, and simple DC circuits.

Academic Org Physics

Components Lecture: 3.00 / Tutorial: 1.00 / Laboratory: 1.00

Requisites Antirequisites: PCS 125 and PCS 211
Equivalencies

Attributes Case Studies, Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

PCS 125

Course ID 001917

Short Title Physics: Waves and Fields

Long Title Physics: Waves and Fields

Long Descr Simple harmonic motion; motion of mechanical waves, wave speed; sound, Doppler effect, interference, standing waves, beats and resonance; gravitational fields and potential energy; electric fields and potential energy; electric potential; magnetic fields.

Academic Org Physics

Components Lecture: 3.00 / Tutorial: 1.00 / Laboratory: 1.00

Requisites Available only to Engineering students.
Equivalencies

Attributes Case Studies, Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

PCS 125E

Course ID	001917
Short Title	Physics: Waves and Fields
Long Title	Physics: Waves and Fields
Long Descr	Simple harmonic motion; motion of mechanical waves, wave speed; sound, Doppler effect, interference, standing waves, beats and resonance; gravitational fields and potential energy; electric fields and potential energy; electric potential; magnetic fields.
Academic Org	Physics
Components	Lecture: 3.00 / Tutorial: 1.00 / Laboratory: 1.00
Requisites	Available only to Engineering students.
Equivalencies	
Attributes	Case Studies, Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

PCS 130

Course ID	010304
Short Title	Physics II
Long Title	Physics II
Long Descr	A continuation of Physics I, calculus-based course. An introduction to oscillations, mechanical waves, magnetism, electromagnetism, optics and nuclear physics. The laboratory is an essential and autonomous part of the course.
Academic Org	Physics
Components	Lecture: 3.00 / Tutorial: 1.00 / Laboratory: 1.00
Requisites	Prerequisite: PCS 120; Antirequisites: PCS 125 and PCS 211 and (PCS 102 or SCI 104)
Equivalencies	
Attributes	Case Studies, Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

PCS 181

Course ID 005324

Short Title Introduction to Astronomy

Long Title Introduction to Astronomy

Long Descr This course will examine astronomical ideas both in relation to their times and in the light of current scientific theory and technical data. Application of the scientific method will be emphasized in evaluating these data and theories. Method of collection and analysis of data will be presented to help the nontechnical student in asking fundamental questions about scientific theories. Topics covered include cosmology, origin of the stars and galaxies, evolution of stars, the solar system, exobiology, death of stars, stellar remnants and the age of the universe.

Academic Org Physics

Components Lecture: 3.00

Requisites Not available to Engineering students.
Equivalencies

Attributes Lower Level Liberal Studies
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

PCS 182

Course ID 024692

Short Title Life in the Milky Way Galaxy

Long Title Life in the Milky Way Galaxy

Long Descr The scientific method of investigation will be emphasized in topics relevant to the search for extraterrestrial life, from microbes to self-cognizant entities. The course presents current ideas concerning the origin of the atomic elements, star and planetary formation, environmental requirements and constraints, early cell formation and evolution, habitable zones, extremophiles, the potential for life in our solar system, exoplanets and their spectra, the Drake equation, intelligence, Kardashev classification, the Fermi paradox and related subjects.

Academic Org Physics

Components Lecture: 3.00

Requisites Not available to Engineering students.
Equivalencies

Attributes Lower Level Liberal Studies
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1

Course Topics

PCS 211

Course ID	005023
Short Title	Physics: Mechanics
Long Title	Physics: Mechanics
Long Descr	Vector forces: forces along a line, coplanar force systems - essentials of vector algebra in two and three dimensions. Moment of a force; moment of a couple; principle of moments. Free body diagrams and equilibrium conditions. Centre of mass and centroids of bodies. Rectilinear and curvilinear motion kinematics. Newton's laws and equations of motion. Friction. Work and Energy; Linear momentum and angular momentum.
Academic Org	Physics
Components	Lecture: 3.00 / Tutorial: 1.00 / Laboratory: 1.00
Requisites	Available only to Engineering students.
Equivalencies	
Attributes	Case Studies, Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

PCS 211E

Course ID	005023
Short Title	Physics: Mechanics
Long Title	Physics: Mechanics
Long Descr	Vector forces: forces along a line, coplanar force systems - essentials of vector algebra in two and three dimensions. Moment of a force; moment of a couple; principle of moments. Free body diagrams and equilibrium conditions. Centre of mass and centroids of bodies. Rectilinear and curvilinear motion kinematics. Newton's laws and equations of motion. Friction. Work and Energy; Linear momentum and angular momentum.
Academic Org	Physics
Components	Lecture: 3.00 / Tutorial: 1.00 / Laboratory: 1.00
Requisites	Available only to Engineering students.
Equivalencies	
Attributes	Case Studies, Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

PCS 213

Course ID	000779
Short Title	Light and Modern Physics
Long Title	Physics: Light and Modern Physics
Long Descr	Ray and wave models of light; reflection, refraction and interference; lenses and mirrors; diffraction and polarization of light; Planck's hypothesis, Bohr's atomic model, photoelectric effect, uncertainty principle, Schrödinger's equation; nuclear properties and binding energy; radioactivity; nuclear reactions.
Academic Org	Physics
Components	Lecture: 3.00 / Laboratory: 1.00
Requisites	Prerequisite: PCS 125
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

PCS 213E

Course ID	000779
Short Title	Light and Modern Physics
Long Title	Physics: Light and Modern Physics
Long Descr	Ray and wave models of light; reflection, refraction and interference; lenses and mirrors; diffraction and polarization of light; Planck's hypothesis, Bohr's atomic model, photoelectric effect, uncertainty principle, Schrödinger's equation; nuclear properties and binding energy; radioactivity; nuclear reactions.
Academic Org	Physics
Components	Lecture: 3.00 / Laboratory: 1.00
Requisites	Prerequisite: PCS 125
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

PCS 224

Course ID	001154
Short Title	Solid State Physics
Long Title	Solid State Physics
Long Descr	Quantum mechanics and quantum nature of solids, properties of materials. Band theory in metals and semiconductors. Conduction processes, the p-n junction, transistors and other solid state devices.
Academic Org	Physics
Components	Lecture: 3.00 / Tutorial: 1.00 / Laboratory: 1.00
Requisites	Prerequisite: PCS 110 or PCS 125 or PCS 130
Equivalencies	PCS724/PCS224
Attributes	Case Studies, Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

PCS 224E

Course ID 001154

Short Title Solid State Physics

Long Title Solid State Physics

Long Descr Quantum mechanics and quantum nature of solids, properties of materials. Band theory in metals and semiconductors. Conduction processes, the p-n junction, transistors and other solid state devices.

Academic Org Physics

Components Lecture: 3.00 / Tutorial: 1.00 / Laboratory: 1.00

Requisites Prerequisite: PCS 110 or PCS 125 or PCS 130
Equivalencies PCS724/PCS224

Attributes Case Studies, Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

PCS 227

Course ID 010154

Short Title Biophysics

Long Title Biophysics

Long Descr Biomechanics principles. Physics of hearing and vision. Fluid mechanics and human circulatory system. Viscosity and viscoelasticity in biological fluids. Thermodynamics of biochemical reactions and metabolism. Random molecular motion in gases and solutions. Electrolytes. Molecular and ionic interactions in solutions. Membrane's structure and properties. Diffusion and osmosis in biological organisms. Electrochemistry of cells. Action potential and electrical activity of neurons.

Academic Org Physics

Components Lecture: 3.00

Requisites Prerequisites: (PCS 130 and MTH 131) or (PCS 125 and PCS 211 and MTH 140) or (PCS 130 and MTH 207)
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

PCS 228

Course ID	010145
Short Title	Electricity and Magnetism
Long Title	Electricity and Magnetism
Long Descr	Fundamentals of Classical Electromagnetism. Electrostatics: charges, electrostatic force, electric field, electric flux, Gauss's law, electric potential, electrostatic energy, properties of conductors. Magnetostatics: Magnetic field, magnetic flux, electric current and Ampere's Law. Faraday's Law of electromagnetic induction. Maxwell equations: electromagnetic waves and the nature of light.
Academic Org	Physics
Components	Lecture: 3.00 / Tutorial: 1.00 / Laboratory: 1.00
Requisites	Prerequisites: (PCS 130 and MTH 330) or (PCS 125 and PCS 211 and MTH 312) or (PCS 125 and PCS 211 and MTH 425)
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

PCS 229

Course ID	010235
Short Title	Intro to Medical Physics
Long Title	Introduction to Medical Physics
Long Descr	Applications of physics in medicine. This survey course will address basic concepts of medical imaging, nuclear medicine and radiation isotopes, radiation therapy, gamma spectroscopy and trace element analysis, and biomedical laser applications.
Academic Org	Physics
Components	Lecture: 3.00 / Tutorial: 1.00
Requisites	Prerequisites: PCS 130 and (MTH 131 or MTH 310); Antirequisite: BME 229
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

PCS 230

Course ID 010250

Short Title Photonics and Optical Devices

Long Title Photonics and Optical Devices

Long Descr This course is designed to provide students with direct experience in the operation of optical devices that find widespread use in the technology sector. Emphasis is placed on geometric optics, laser systems, image formation, fiber optics, diffraction and interference.

Academic Org Physics

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Prerequisites: (PCS 130 and MTH 231) or (PCS 125 and PCS 211 and MTH 141 and MTH 240) or (PCS 130 and MTH 310)

Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

PCS 300

Course ID 022929

Short Title Modern Physics

Long Title Modern Physics

Long Descr Special Relativity: simultaneity, time dilation, length contraction, Lorentz transformations, velocity addition, rest mass, energy. Blackbody radiation: Boltzmann's and Wien's Laws, Planck's quantization. Photoelectric effect. Compton effect. Atomic spectra. Rydberg's formula. Thompson's and Rutherford's atomic models. Bohr's model of the atom.

Academic Org Physics

Components Lecture: 3.00 / Tutorial: 1.00

Requisites Prerequisites: (MTH 231 and PCS 130) or (PCS 125 and PCS 211 and MTH 141 and MTH 240) or (PCS 130 and MTH 310)

Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

PCS 335

Course ID 010143

Short Title Thermodynamics Stat. Physics

Long Title Thermodynamics and Statistical Physics

Long Descr Thermodynamics zeroth law and temperature: thermodynamic systems, variables, state equations, thermometry. First law of Thermodynamics: work, heat, phase transformations. Second law of Thermodynamics: irreversible processes, entropy. Kinetic theory of gases. Introduction to statistical mechanics.

Academic Org Physics

Components Lecture: 3.00 / Tutorial: 1.00

Requisites Prerequisites: (PCS 130 and PCS 623) or (PCS 130 and MTH 380) or (PCS 130 and MTH 304) or (PCS 125 and PCS 211 and MTH 410)

Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

PCS 350

Course ID 010302

Short Title Computatnl Methds/Med Physics

Long Title Computational Methods in Medical Physics

Long Descr This course covers the basics of scientific programming and introduces the student to common computational methods with examples from medical and biological physics. It will cover topics such as random number generation, Monte Carlo methods, random walks, numerical solutions to ordinary and partial differential equations for initial-value and boundary-value problems, modelling/parameter fitting of real systems, and cellular automata. When time permits, this course also covers the Ising spin model and fractals.

Academic Org Physics

Components Lecture: 3.00 / Laboratory: 3.00

Requisites Prerequisite: PCS 622 or (MTH 501 and MTH 430)

Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

PCS 352

Course ID	010255
Short Title	Nuclear Physics
Long Title	Nuclear Physics/Radiation Protection
Long Descr	Introduction to nuclear physics. Nuclear structure and binding energy. Nuclear decays, radioactivity and nuclear reactions. Interaction of radiation with matter. Introduction to dosimetry and dose calculations.
Academic Org	Physics
Components	Lecture: 3.00 / Tutorial: 1.00 / Laboratory: 1.00
Requisites	Prerequisites: (PCS 400 or PCS 401) and (MTH 304 or MTH 380 or MTH 410 or PCS 623)
Equivalencies	
Attributes	Case Studies, Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

PCS 354

Course ID 010272

Short Title Radiation Biology

Long Title Radiation Biology

Long Descr Introduction to basic physics and chemistry of radiation interactions, free radicals, oxidation and reduction. Subcellular and cellular effects: killing, repair, sensitization and protection. Measurement methods. Survival curves and their significance. Modification of the radiation response. Tissue effects, genetic and carcinogenic effects, mutations, hazards. Effects of heat on tissue. Thermal dosimetry. Biology of Thermal Potentiation of Radiotherapy. High temperature thermal therapy.

Academic Org Physics

Components Lecture: 3.00

Requisites Prerequisite: PCS 229 and BLG 311
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

PCS 358

Course ID 022923

Short Title Mechanics

Long Title Mechanics

Long Descr This course will cover topics relevant to Medical Physics on dynamics of particles and of rigid bodies: center of mass; three dimensional motion of particles; kinematics and dynamics of rotational motion; motion of rigid bodies; mechanical oscillations and waves; coupled oscillations; introduction to fluid dynamics; motion in resistive fluids.

Academic Org Physics

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Prerequisites: (PCS 120 and MTH 330) or [PCS 211 and (MTH 312 or MTH 425)]
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

PCS 400

Course ID	022930
Short Title	Quantum Physics I
Long Title	Quantum Physics I
Long Descr	Blackbody radiation. Planck quantization of the Harmonic Oscillator. Photoelectric effect. Photons. Bohr model of hydrogenic ions. Matter waves. Heisenberg's uncertainty relations. Review of complex numbers. The Schrödinger Equation in one dimension. Wave functions. Stationary states. Quantization of energy. Eigenfunctions and Eigenvalues. Infinite square well. Harmonic oscillator. Superposition of eigenfunctions. Schrödinger equation in three dimensions. The hydrogen atom.
Academic Org	Physics
Components	Lecture: 3.00
Requisites	Prerequisites: CHY 344 and (MTH 312 or MTH 330 or MTH 425); Antirequisite: PCS 401
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

PCS 401

Course ID 026133

Short Title Quantum Mechanics I

Long Title Quantum Mechanics I

Long Descr Review of Bohr's model, matter waves and complex variables. Schrödinger Equation. Wave functions. Stationary states. Quantization of energy. Eigenfunctions and Eigenvalues. Probability interpretation, expectation values. Infinite and finite square wells; barriers, tunnelling. Harmonic oscillator. Heisenberg uncertainty relations. Measurements in Quantum Mechanics. Hermitian operators. Hilbert Space. Superposition of eigenstates. Schrödinger equation in three dimensions. Central potentials. The hydrogen atom.

Academic Org Physics

Components Lecture: 3.00

Requisites Prerequisites: (PCS 300) and (MTH 312 or MTH 330 or MTH 425); Antirequisite: PCS 400

Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

PCS 405

Course ID 010207

Short Title Medical Imaging

Long Title Medical Imaging

Long Descr Diagnostic radiology with X-rays, X-ray transmission computed tomography. The physics of radioisotope imaging, emission computed tomography, clinical applications of radioisotope imaging. Diagnostic ultrasound, clinical applications and biological aspects of diagnostic ultrasound. Nuclear magnetic resonance, nuclear magnetic resonance pulse sequences and relaxation processes and their measurement; image acquisition and reconstruction. The mathematics of image formation and image processing.

Academic Org Physics

Components Lecture: 3.00 / Tutorial: 1.00 / Laboratory: 1.00

Requisites Prerequisites: PCS 229 and PCS 622
Equivalencies

Attributes Case Studies, Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1

Course Topics

PCS 406

Course ID	010146
Short Title	Radiatn Protectn/Health Physic
Long Title	Radiation Protection/Health Physics
Long Descr	External radiation protection. Internal dosimetry and radiation protection. Radiation exposure from background and man-made sources. Radiation levels and regulations.
Academic Org	Physics
Components	Lecture: 3.00
Requisites	Prerequisites: PCS 229 and PCS 352
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

PCS 407

Course ID	010226
Short Title	Radiation Therapy
Long Title	Radiation Therapy
Long Descr	Introduction to radiation therapy physics. Radiation therapy units. Interaction of radiation with tissue. Dosimetry of a single beam of x-ray. Beam calibration and patient dose calculation. Combination of beams and treatment planning. Brachytherapy. Radiation detection. Measuring radiation and radiation protection.
Academic Org	Physics
Components	Lecture: 3.00 / Laboratory: 1.00
Requisites	Prerequisites: PCS 229 and PCS 352
Equivalencies	
Attributes	Lab Work
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

PCS 450

Course ID	024316
Short Title	Directed Project I
Long Title	Directed Project I
Long Descr	This course makes it possible for one or more students to work under the guidance of a faculty member on a project in a specific area of Physics not covered in depth in any other course. The work done for this course must result in an oral or written presentation and may contain an element of originality. Enrolment in this course requires approval by the Program Director.
Academic Org	Physics
Components	Lecture: 3.00
Requisites	
Equivalencies	
Attributes	Research Project
Dept Consent	Department Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

PCS 510

Course ID 005124

Short Title Fundamentals of Astrophysics

Long Title Fundamentals of Astrophysics

Long Descr This course presents a mathematical and conceptual treatment of basic astronomical ideas, stressing observations and theoretical principles. Phenomena which currently enjoy mass appeal (black holes, extraterrestrial life, etc.) will be explored from the scientific point of view. Topics include: electromagnetic spectrum, cosmology, galaxies, star formation, stellar properties, star death, and exobiology.

Academic Org Physics

Components Lecture: 3.00

Requisites Prerequisites: PCS 110 or PCS 130 or (PCS 125 and PCS 211)
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

PCS 520

Course ID 025246

Short Title Nanophysics

Long Title Nanophysics

Long Descr Introductory course on nanotechnology and applications in biology and medicine. Physics at nano-scale of nano-particles and nano-devices. Fabrication and characterization of nanostructures. Magnetic and optical effects at nano-scale. Transport properties and nanotechnology.

Academic Org Physics

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Prerequisites: PCS 227
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

PCS 521

Course ID 026082

Short Title Mathematical Physics

Long Title Mathematical Physics

Long Descr Introduction to complex variables and their role in physics. Taylor formula, truncation error and round-off error. Nonlinear interpolation and curve fitting. Numerical integration. Ordinary differential equations, systems of linear differential equations. Differential equations of first and second order and their applications in physics. Numerical solutions of non-linear differential equations. All topics will be illustrated with physics examples including, but not limited to, damped oscillations, forced oscillations and resonance, motion with variable acceleration, motion in a viscous fluid. Use of MATLAB programming language.

Academic Org Physics

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Prerequisites: PCS 300 and MTH 108; Antirequisite: MTH 501
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

PCS 530

Course ID 025247

Short Title Cellular Biophysics

Long Title Cellular Biophysics

Long Descr This course presents physical principles important to the operation of biological systems such as entropy, diffusion, cellular electricity, cellular motor forces, mechanical properties of the cell, and selected topics from radiation biophysics, biological switches, sensory physics, waves, self-organization, and biological complexity.

Academic Org Physics

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Prerequisites: PCS 227
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

PCS 550

Course ID	024315
Short Title	Directed Project II
Long Title	Directed Project II
Long Descr	This course makes possible for one or more students to work under the guidance of a faculty member on a project in a specific area of Physics not covered in depth in any other course. The work done for this course must result in an oral or written presentation and may contain an element of originality. Enrolment for this course requires approval by the Program Director.
Academic Org	Physics
Components	Lecture: 3.00
Requisites	
Equivalencies	
Attributes	Research Project
Dept Consent	Department Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

PCS 581

Course ID 024691

Short Title Advanced Topics in Astronomy

Long Title Advanced Topics in Astronomy

Long Descr The scientific method of investigation will be applied to an in-depth presentation of contemporary astronomical research on cosmology, parallel universes, white dwarfs, neutron stars, black holes, wormholes, Dark Matter, galaxy formation and evolution, Dark Energy, exobiology, the Drake equation and related topics.

Academic Org Physics

Components Lecture: 3.00

Requisites Prerequisites: PCS 181 or PCS 510; Not available to students in the Faculty of Engineering and Architectural Science.

Equivalencies

Attributes Upper Level Liberal Studies
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

PCS 622

Course ID 026083

Short Title Math Methods in MedPhys

Long Title Mathematical Methods in Medical Physics

Long Descr Physics and Medical Physics applications of Dirac delta function, Fourier series and Fourier transforms. Laplace's equation solutions. Transport phenomena. Applications of partial differential equations and boundary value problems illustrated with solutions of wave and diffusion equations. This course uses MATLAB as its programming language.

Academic Org Physics

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Prerequisite: PCS 521
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

PCS 623

Course ID 026084

Short Title Biostatistics

Long Title Biostatistics

Long Descr Introduction to experimental design, data presentation and statistics in biomedical sciences with a focus on application and interpretation. Fundamentals of probability including discrete and continuous models. Randomization and sample size. Foundations of statistical inference, hypothesis testing, p-value, confidence intervals, regression and correlation. Elementary non-parametric statistical methods. Presentation and communication of statistical data. Use of graphical and statistical software.

Academic Org Physics

Components Lecture: 3.00 / Tutorial: 1.00

Requisites Prerequisite: MTH 231; Antirequisite: MTH 380
Equivalencies

Attributes Case Studies, Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

PCS 624

Course ID 026120

Short Title Electromagnetism II

Long Title Electromagnetism II

Long Descr Solving Poisson and Laplace equations via method of images and separation of variables. Multipole expansion for electrostatics, electric dipoles, polarization in dielectrics. Magnetic vector potential. Multipole expansion in magnetostatics, magnetic dipoles, magnetization in matter, Maxwell's equations in matter. Boundary conditions. Poynting’s Theorem. Electromagnetic waves in matter. Electromagnetic Radiation.

Academic Org Physics

Components Lecture: 3.00 / Tutorial: 1.00

Requisites Prerequisite: PCS 228
Equivalencies

Attributes Case Studies, Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

PCS 700

Course ID	022932
Short Title	Quantum Mechanics II
Long Title	Quantum Mechanics II
Long Descr	Operators. Commuting and non-commuting observables. The Heisenberg uncertainty relations. Measurement in Quantum Mechanics. Collapse of the wave-function. Angular momentum - eigenvalues and eigenfunctions. Matrix representations of operators and wave functions. Stern-Gerlach experiment. Spin. Time-independent perturbation theory. Fine structure. The Zeeman effect. Identical particles, atoms and solids. Variational calculations. The helium atom. Finite basis set calculations.
Academic Org	Physics
Components	Lecture: 3.00
Requisites	Prerequisites: PCS 401 and (MTH 309 or MTH 312 or MTH 425 or MTH 430)
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

PCS 724

Course ID 022933

Short Title Condensed Matter Physics

Long Title Condensed Matter Physics/Materials

Long Descr Properties of materials, crystal structure, types of bonding, crystal vibrations. Dielectrics, metals and semiconductors. Free-electron model and conductivity in metals. Band theory in metals and semiconductors. The p-n junctions, transistors and other solid state devices. Phase transitions in ferromagnetic, ferroelectric and other materials. Surface properties. Biomaterials and nanostructures.

Academic Org Physics

Components Lecture: 3.00 / Laboratory: 1.00

Requisites Prerequisites: PCS 300 and (MTH 312 or MTH 330 or MTH 425)
Equivalencies PCS724/PCS224

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

PCS 800

Course ID 026858

Short Title Dynamical Systems

Long Title Dynamical Systems

Long Descr This course is an introduction to how to model and analyze the behavior of a complex system as it changes in time. The course will introduce and review linear and nonlinear differential equations in one and two dimensions, and the elements of phase space analysis, including fixed points, periodic solutions, and their stability. Students will apply these techniques to some of the most famous nonlinear models from fields ranging from physics to neuroscience to ecology including the Logistic Model, Duffing Oscillator, Hodgkins-Huxley equations,and so on. Finally, students will learn about some of the surprising consequences of nonlinearity, such as fractals, synchronization, and chaos.

Academic Org Physics

Components Lecture: 3.00

Requisites Prerequisites: MTH 425 or MTH 312 or MTH 430
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1

Course Topics

PCS 810

Course ID	026859
Short Title	Complex Networks and Appl
Long Title	Complex Networks and Applications
Long Descr	An introduction to the emerging science of networks, with applications to biology, social science, engineering, and other fields. Students will learn about the field's origins in graph theory, and the surprising properties of real-world networks such as the small-world effect. They will also learn to analyze the rich structure present in networks through degree correlations, communities, and motifs. Finally, it will discuss how networks shape the spread of large-scale failures like power blackouts and epidemics.
Academic Org	Physics
Components	Lecture: 3.00
Requisites	Prerequisites: (MTH 231 or MTH 240 or MTH 310) and (PCS 623 or MTH 380 or MTH 304 or MTH 410)
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

SCI 102

Course ID 010278

Short Title Chaos and Fractals

Long Title Chaos and Fractals

Long Descr This is an introductory course on an exciting field of modern mathematics which has many applications. Topics will include: What is a chaotic system? What makes a system chaotic? Fractals; drawing fractals, fractals in nature. Strange attractors. Julia sets. The Mandelbrot set - and more. Along the way we will look at the historical development of these ideas and how they are used today in areas such as physics, biology, medicine, and economics.

Academic Org Faculty of Science

Components Lecture: 3.00

Requisites Antirequisite: MTH 322
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

SCI 130

Course ID 025679

Short Title Robotic Devices Embedded Syst.

Long Title Mobile Robotic Devices Embedded Systems

Long Descr This course provides applied learning in inventing and programming mobile robotic devices (e.g., cell phones, drones) with embedded or electronic systems. Students engage in hands-on mobile robotic device embedded systems applications and invention through the planning and execution of mobile robotic device systems development,facilitated with mobile robotic kits for embedded system development. This course also provides project management process flow-throughs on planning and executing mobile robotics and embedded systems devices.

Academic Org Faculty of Science

Components Lecture: 3.00

Requisites
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

SCI 180

Course ID	010170
Short Title	Orientation
Long Title	Orientation
Long Descr	This course focuses on topics designed to improve the effectiveness of learning strategies and study skills. This course includes discussions on topics such as effective communication skills, learning styles, theory of learning and successful problem solving, career planning, the Co-op program, effective use of the library and other topics that will help students to become more resourceful and successful in their program. All students in Science programs must enroll in SCI 180 in their first semester of studies. This course is graded on a pass/fail basis.
Academic Org	Faculty of Science
Components	Lecture: 1.00
Requisites	
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	Department Consent Required
Dynamic Date	TRANSITION
Grd Basis	Pass/Fail
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

SCI 200

Course ID 026867

Short Title Professionalism in Science

Long Title Professionalism in Science

Long Descr This course will address a gap in career education for students in the Faculty of Science. This course is concerned with the development of knowledge, skills and attitudes which will assist students in successful exposure to their first Co-op work terms, making informed decisions about their careers, effective participation in working life, future professional development.

Academic Org Faculty of Science

Components Lecture: 3.00

Requisites
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

SCI 222

Course ID 026868

Short Title Evidence-Based Security

Long Title Evidence-Based Security

Long Descr This course will introduce students to the scientific method, and build an appreciation of how this rigorous method enables an understanding of the broad sweep of cyber threats and the ability to assess trade-offs in sustaining network missions while mitigating attacks. Elements of cyber-risk/cybersecurity will be examined from the point of view of confidentiality, integrity, availability, risk, adversarial thinking, and systems thinking.

Academic Org Faculty of Science

Components Lecture: 3.00

Requisites
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

SCI 230

Course ID 025914

Short Title Emergency Management Practice

Long Title Emergency Management Practice

Long Descr This course provides an introduction to the basic concepts of emergency management with core elements common to all provinces and territories across Canada. A series of principles will be introduced with reference to current practice. This course provides an introduction to the legal basis for Emergency Management nationally, regionally, and locally. The course is designed for participants from all levels of government, emergency measures/management coordinators, and/or planners, emergency responders, volunteers, private sector representatives.

Academic Org Faculty of Science

Components Lecture: 3.00

Requisites
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

SCI 232

Course ID 025915

Short Title Incident Operations Management

Long Title Incident and Operations Management

Long Descr This course prepares emergency management practitioners to carry out their roles as members of an Emergency Operations Centre (EOC) team. This course presents strategies for effective management and coordination of overall operations within their communities during a multi-service response to an emergency. In addition, participants will be introduced to the Incident Command System that provides responders and supporting agencies with a standardized method of managing any kind of emergency incident.

Academic Org Faculty of Science

Components Lecture: 3.00

Requisites
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1

Course Topics

SCI 234

Course ID	025916
Short Title	Analysis of Critical Incidents
Long Title	Analysis of Critical Incidents
Long Descr	In this course students will gain an understanding of Operations in relation to EM practice. The range of potential actions is introduced during the pre-impact and impact phases of an emergency. Current legislation, emergency prevention, communications during emergencies, current pre-impact arrangements, the roles, responsibilities, and authority of the Emergency Services and specifically what actions could be taken during the impact phase of an emergency/disaster will be discussed in relation to several case studies.
Academic Org	Faculty of Science
Components	Lecture: 3.00
Requisites	
Equivalencies	
Attributes	
Dept Consent	No Special Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Graded
Hegis Code	
GPA Weight	1.00/1.00
Billing Units	1.0
Course Count	1.0
Repeat for Credit	N
Total Completions	1
Course Topics	

SCI 241

Course ID 025917

Short Title Planning Emergency Management

Long Title Planning for Emergency Management

Long Descr This course introduces emergency management planning. It examines the planning process, the specification of emergency management needs, resource availability, needs ratification, organizational design, the selection of emergency management strategies, and planning implementation.

Academic Org Faculty of Science

Components Lecture: 3.00

Requisites
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

SCI 243

Course ID 025918

Short Title Continuity and Risk Management

Long Title Continuity and Risk Management

Long Descr This course presents the principles, structures, and processes of risk management. Methods for applying general risk management theory, best practices and resources to the different phases of emergency management will be discussed. Emphasis is placed on the application of risk management strategies in mitigating and preparing for disasters and major emergencies.

Academic Org Faculty of Science

Components Lecture: 3.00

Requisites
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

SCI 444

Course ID 026869

Short Title Cybersecurity and Society

Long Title Cybersecurity and Society

Long Descr Students will use an interdisciplinary lens to explore how technology impacts cybersecurity. The topics cut across various knowledge areas in cyber, including Software Security, Human-centred Security, and Societal Security. Attention is given to the way that technology-driven cybersecurity issues are connected to cultural, political, legal, ethical, and business domains.

Academic Org Faculty of Science

Components Lecture: 3.00

Requisites
Equivalencies

Attributes
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

SCI 888

Course ID 026085

Short Title Evidence-based Innovation

Long Title Evidence-based Innovation

Long Descr This course will reintroduce students to the scientific method, and build an appreciation of how this rigorous method can be used to develop sustainable ventures and ideas (both social and technological in nature). By understanding how to develop a value-proposition, this course will allow students to explore consulting and apply their classroom knowledge to build careers based on problem-solving. A strong emphasis will be placed on communication, networking and collaborative discovery.

Academic Org Faculty of Science

Components Lecture: 2.00 / Laboratory: 2.00

Requisites
Equivalencies

Attributes Lab Work
Dept Consent No Special Consent Required
Drop Consent No Special Consent Required
Dynamic Date TRANSITION
Grd Basis Graded
Hegis Code
GPA Weight 1.00/1.00
Billing Units 1.0
Course Count 1.0
Repeat for Credit N
Total Completions 1
Course Topics

SCI 999

Course ID	025919
Short Title	Research Practicum
Long Title	Research Practicum
Long Descr	This non-credit practicum offers the student research experience as part of a research team. A student who wants to enroll in this practicum must first identify a faculty member with whom they wish to work and then ensure the faculty member agrees to act as supervisor before enrolling in this practicum. This course is graded on a pass/fail basis. See teaching department for consent criteria.
Academic Org	Faculty of Science
Components	Laboratory: 3.00
Requisites	
Equivalencies	
Attributes	External Project
Dept Consent	Department Consent Required
Drop Consent	No Special Consent Required
Dynamic Date	TRANSITION
Grd Basis	Pass/Fail
Hegis Code	
GPA Weight	0.00/0.00
Billing Units	0.0
Course Count	0.0
Repeat for Credit	Y
Total Completions	30
Course Topics	

Run Control Values

Academic Institution:	RYERU
Academic Career:	UGRD
Academic Group:	
Academic Organization:	SCIENCE
Subject:	
From Date	01-JAN-1901
Thru Date	01-AUG-2024
EFF_STATUS	A
Schedule Course	Y

Course Attributes - Run Control Values

DATETIME CREATED:	06-OCT-2023
COURSE ATTRIBUTE:	LVL
COURSE ATTRIBUTE VALUE:	
DATETIME CREATED:	06-OCT-2023
COURSE ATTRIBUTE:	EXPL
COURSE ATTRIBUTE VALUE:	