Description of Postgraduate Courses -- Research Postgraduate Course Sharing Scheme (Fall Term 2024-2025)

Last Update: 22 August 2024

Important Information about HKUST Courses:

Level of Courses

All courses offered in this scheme are at postgraduate level.

Course Vector and Credits

Each course is assigned a course vector which indicates the number of instructional hours required and credits to be earned. The course vector is presented in the form of [L-T-Lab:C] where

L = lecture hours per week
T = tutorial, seminar or recitation hours per week
Lab = laboratory or field study hours per week
C = number of course credits

For example, a course vector of [3-1-2:3] denotes a course that requires 3 lecture hours, 1 tutorial/seminar/recitation hour, and 2 laboratory/field study hours each week, and carries 3 credits.

Medium of Instruction

The medium of instruction is English. Some courses will have the following notations in the course description to specify the language of reading materials or permitted spoken language (dialect) used in teaching.

[C] Courses may required students to read materials in Chinese. Students who have difficulty reading materials in Chinese should consult the instructor concerned prior to enrolling in these courses.

[Pu] / [Ca] Courses approved to be taught in Chinese carry a *[Pu]* or *[Ca]* notation in the course description, which indicates the spoken language used in teaching: *[Pu]* stands for Putonghua; and *[Ca]* for Cantonese.

Postgraduate Grades

Students receive a grade in each course in which they are enrolled. Grades range in equal increments from A+ to F (i.e. A+, A, A-, B+, B, B-, C+, C or F). The Pass, Ungraded (P) grade is given only for courses that are indicated in the course description that they will be graded as such.

BIEN

BIEN 5050	Global Health Ethics	2-1-0:3

[Previous Course Code: BIEN 6930A] Through real-time videoconferencing with participants from different countries such as the United States, United Kingdom, Australia, Mexico, and Philippines, this ONLINE course aims at helping students learn the definitions of global health ethics and bioethics, the different protocol and systems in place to ensure adherence to ethical principles, and how different stakeholders and cultures may interpret ethics differently. Through case studies on ethical challenges from real-world situations, students will analyze and discuss the complexities of global health practice and research ethics in a global context. This course is co-offered with the University of Southern California. Besides the joint LIVE sessions, face-to-face sessions and group projects are also arranged for the introduction of background knowledge, case studies, group project discussion, and technical support.

CHEM

CHEM 5110	Advanced Organic Chemistry I	3-0-0:3
Mechanism and theory in organic chemistry, molecular orbital theory, structure-activity relationships, isotope effects, solvent effects, neighboring group participation, and reactive intermediates. Background: CHEM 2118 (prior to 2017-18), CHEM 3120 and CHEM 4140		
CHEM 5120	Advanced Organic Chemistry II	3-0-0:3
Stereochemistry and conformational analysis, reactions of various classes of organic compounds, synthetic organic chemistry, modern methods of synthesis including specific methodologies and multistep complex syntheses. Prerequisite(s): CHEM 5110		
CHEM 5230	Quantum Chemistry	3-0-0:3
Introduction to basic theories of Quantum Chemistry. Popular theories used in modern Quantum Chemistry such as Hantree-Fock theory, Density Functional theory. Perturbation Theories, and other quantum chemistry theories will be introduced in this course. Background: CHEM 3420 OR Equivalent		
CHEM 5310	Advanced Inorganic Chemistry I	3-0-0:3
Symmetry, group theory; molecular orbitals, electronic states; ligand field theory; electronic structure of metal complexes; theory of bonding and structure of inorganic compounds; chemistry of the elements; major physical methods used in the determination of molecular structure and bonding.		
CHEM 5340	Chemical X-ray Crystallography	3-0-0:3
Applications of X-ray diffraction methods to the determination of crystal structures, including crystal symmetry, reciprocal lattice, intensity of diffraction, the phase problem, and refinement of structure parameters, powder X-ray diffraction analysis.		

CIVL

CIVL 5220	BIM and Digital Construction	3-0-0:3
[Previous Course Code: CIVL 6100B] This course covers the principles and applications of information technology for construction management. Topics include building information modeling, database management and implementation, web-based communication and project management technologies, decision support systems, knowledge management, and data processing and analysis. Background: CIVL 3210		
CIVL 5450	Hazardous Waste Treatment and Site Remediation	3-0-0:3
Regulatory aspects of the handling and disposal of hazardous wastes, and innovative technologies for hazardous wastes treatment and contaminated soils such as bioremediation, and soil washing will be included. Exclusion(s): CIEM 5410, JEVE 5410 Prerequisite(s): CIVL 2410		
CIVL 5750	Geotechnical Earthquake Engineering and Soil Dynamics	3-0-0:3
Earthquakes and characterization of ground motions, seismicity assessment, soil dynamics and site response analysis, soil liquefaction assessment and post-liquefaction analysis, seismic analysis of slopes and embankments, lateral earth pressures and retaining systems, dynamic soil-structure interaction. Background: CIVL 3740		

CIVL 5830	Advanced Mechanics of Materials	3-0-0:3
Analysis of stress and strain; elastic and inelastic behavior of materials; formulation of BVP; beam on elastic foundations; torsion of noncircular thinwalled members; deformation of cylinders and spheres; inelastic analysis.		
CIVL 6050J	Civil Engineering Seminar I	1-0-0:0
Discussion of current research by faculty members, and guest lectures on recent advances in civil engineering. Graded P or F.		

COMP

COMP 5211	Advanced Artificial Intelligence	3-0-0:3
This advanced AI course will cover advanced concepts and techniques in AI. The major topics will be: problem solving, knowledge and reasoning, planning, uncertain knowledge and reasoning, learning, and robotics.		
COMP 5212	Machine Learning	3-0-0:3
Introduction to major learning paradigms and techniques, basic applied statistics and information theory, decision trees, neural networks, Bayesian classification, kernel methods, clustering, density estimation, feature selection and extraction, hidden Markov models, reinforcement learning, case-based learning, model selection and various applications. Background: COMP 2012, probability theory and linear algebra Exclusion(s): CSIT 5910, MSBD 5012		
COMP 5331	Knowledge Discovery in Databases	3-0-0:3
An introduction to knowledge discovery in databases. Different discovery and learning techniques are presented and compared. Automatic generation of query language expressions is discussed in depth. Potential applications are shown. Background: COMP 3311 Exclusion(s): CSIT 5210, MSBD 5002		
COMP 5621	Computer Networks	3-0-0:3
Principles, design and implementation of computer communication networks; network architecture and protocols, OSI reference model and TCP/IP networking architecture; Internet applications and requirements; transport protocols, TCP and UDP; network layer protocols, IP, routing, multicasting and broadcasting; local area networks; data link and physical layer issues; TCP congestion control, quality of service, emerging trends in networking. Exclusion(s): COMP 4622 (prior to 2018-19)		
COMP 6211J	Advanced Large-Scale Machine Learning Systems for Foundation Models	3-0-0:3
In recent years, foundation models have fundamentally revolutionized the state-of-the-art of artificial intelligence. Thus, the computation in the training or inference of the foundation model could be one of the most important workflows running on top of modern computer systems. This course unravels the secrets of the efficient deployment of such workflows from the system perspective. Specifically, we will i) explain how a modern machine learning system (i.e., PyTorch) works; ii) understand the performance bottleneck of machine learning computation over modern hardware (e.g., Nvidia GPUs); iii) discuss four main parallel strategies in foundation model training (data-, pipeline-, tensor model-, optimizer-parallelism); and iv) real-world deployment of foundation model including efficient inference and fine-tuning. Instructor's approval is required.		

ELEC

ELEC 5010	Introduction to the Design & Implementation of Micro-Systems	3-0-1:3
Introduction to the concept of micro-systems. Dimensional scaling and its implications. Multi-physics modeling. Micro-fabrication techniques. Introduction to Coventor, a numerical simulation package for micro-systems. The design, implementation and testing of a micro-device. Exclusion(s): MECH 5950		
ELEC 5040	Advanced Analog IC Analysis and Design	3-0-0:3
Noise analysis; Advanced op-amp design techniques; Analog VLSI building blocks: multipliers, oscillators, mixers, phase-locked loops, A/D and D/A converters; Passive filter design; Frequency scaling; Active filter design. Background: ELEC 4420 and ELEC 4510 Exclusion(s): EESM 5120		
ELEC 5070	Microelectronics Fabrication Technology	3-0-0:3
Process technologies in IC fabrication: epitaxial growth; chemical-vapor and physical-vapor deposition of films; thermal oxidation; diffusion; ion implantation; microlithography; wet/dry etching processes; process integration of MOS and bipolar technologies.		
ELEC 5090	Advanced Photonics Technologies	3-0-0:3
A brief review of modern optics theories, Fourier optics based devices and systems, fundamentals of laser physics, optoelectronics, nonlinear optics and laser spectroscopy.		
ELEC 5110	Nanoelectronic Materials for Energy Technologies	3-0-0:3
[Co-list with ENEG 5200] Conventional and unconventional fabrication of nanostructures including electron beam lithography, nanoimprint, chemical synthesis, self-assembly, etc.; size dependent electronic and optoelectronic properties of nanomaterials; large-scale assembly and integration of nanomaterials for electronics; energy harvesting and storage devices using nanoelectronic materials. Background: ELEC 3500 Exclusion(s): ENEG 5200		
ELEC 5180	RF/Microwave Circuit Design and Measurement	3-0-3:4
Introduction to techniques for analyzing, engineering and testing of circuits for RF/microwave frequencies using CAD tools. The lab provides hands-on CAD/simulation, building and testing of low-noise amplifier, mixer, VCO, filter, IF AGC, detectors and other circuits discussed in lecture. Background: ELEC 3100, ELEC 3400, ELEC 3600 and ELEC 4420		
ELEC 5360	Principles of Digital Communications	3-0-0:3
The aim of this course is to provide an in-depth treatment of the theoretical basis, analysis, and design of digital communication systems. The first half of the course will focus on the theoretical foundations of a basic digital communication system, including source coding, modulating and channel coding, and introductory information theory. The second half will deal with advanced techniques including orthogonal frequency division multiplexing (OFDM), multi-antenna communications, spread-spectrum communications, and cooperative communications. Background: Probability theory Exclusion(s): EESM 5536		
ELEC 5470	Convex Optimization	3-0-0:3
[Co-list with IEDA 5470] Convex optimization theory with applications to communication systems and signal processing: convex sets/functions/problems; Lagrange duality and KKT conditions; saddle points and minimax problems; numerical algorithms; primal/dual decomposition methods. Applications: filter design; robust beamforming; power control in wireless systems; design of MIMO systems; GP duality in information theory; network utility maximization. For PG students in second year or above. Background:		

Linear algebra (also basic digital communications and basic signal processing) Exclusion(s): IEDA 5470		
ELEC 5520	Power Management Integrated Circuit Design	3-0-0:3
Integrated circuit techniques for power management components such as voltage references, linear voltage regulators, low dropout regulators, switch mode power converters and switched-capacitor power converters. Background: ELEC 4420 AND ELEC 4430		
ELEC 6910A	First Principles of Computer Vision	3-0-0:3
This course focuses on the fundamental mathematical and physical principles of computer vision. It begins by introducing the physical imaging process, encompassing crucial subjects such as color, polarization, radiometry, reflectance models, and photometric methods. Subsequently, it explores the realm of geometric multi-view vision, encompassing topics like features, multi-view stereo, optical flow, structure-from-motion, visual SLAM, and NeRF. Finally, the course delves into the domain of semantic vision, examining classification, recognition, segmentation, CNN, LSTM, and Transformers.		
ELEC 6910B	RF Microsystems: Devices and Applications	3-0-0:3
The goal of this course is to develop students' design, analysis, and evaluation skills at microwave/radio frequencies where lumped elements (e.g., resistors, capacitors, inductors) are no longer appropriate. Students will receive the following knowledge: Electromagnetic fields & waves, transmission line theory, Smith Chart, S-parameters, and Network Analysis; RF wireless communication systems; Properties of passive components; Impedance Matching network, RLC networks, and 2-port parameters; Microwave measurement and calibration; Simulation methods for EM passive devices: HFSS & PathWave Advanced Design System (ADS); Micron passive acoustic wave devices: resonators, filters, delay lines; Simulation methods for multi-physic devices: COMSOL; MEMS technologies for RF microsystems. This course discusses methodologies to synthesize and model the operation of several key passive components currently employed in commercial Radio Frequency (RF) microsystems. The operation, design methodologies, and equivalent circuit representations relative to RF devices will be presented.		
ELEC 6910F	Optical Materials and Applications	3-0-0:3
The course explains the optical properties of isotropic (dielectric, metallic, semiconducting) and anisotropic (crystalline, liquid crystalline) materials, and the influence of external fields (electric, magnetic, strain). The optical properties are discussed in various applications (lenses, mirrors, gratings, wave plates, wave plates, modulators, liquid crystal devices.		
ELEC 6910H	Advanced AI Chip and System	3-0-0:3
Artificial Intelligence (AI) techniques have achieved great success in a wide range of applications like computer vision, natural language processing, and scientific computing. Traditional processors are not optimized for AI tasks, which can result in slow performance and high energy consumption. To unlock the full potential of AI, both academia and industry have developed many AI processors for efficient AI computing from edge to cloud, with specialized architecture for the complex computations of AI applications. This is an introductory course to advanced processor architecture for AI computing. The topics covered include AI algorithm basics, processing element, dataflow, memory system, software-hardware co-design for AI processors. This course will also introduce benchmarking and recent advances of AI processors.		

ENEG

ENEG 5200	Nanoelectronic Materials for Energy Technologies	3-0-0:3
[Co-list with ELEC 5110] Conventional and unconventional fabrication of nanostructures including electron beam lithography, nanoimprint, chemical synthesis, self-assembly, etc.; size dependent electronic and		

optoelectronic properties of nanomaterials; large-scale assembly and integration of nanomaterials for electronics; energy harvesting and storage devices using nanoelectronic materials. Background: ELEC 3500 Exclusion(s): ELEC 5110

HUMA

HUMA 5360	History and Theory of Comparative Literature	3-0-0:3
This course introduces students to the field of Comparative Literature through a variety of readings. It examines the development of the discipline by looking into the major theories and methodologies. Through readings and in-class discussions, we explore the significance of reading literature from comparative perspectives, crossing geographical, temporal, and linguistic boundaries. We also encourage students to examine the key concepts, themes, and debates that have shaped the evolving field of comparative literature. **[C]** Exclusion(s): HUMA 5009		
HUMA 5452	Politics of Fan Culture Studies	3-0-0:3
This course explores the theories, debates, and challenges surrounding the study of media theories of fan culture as a site of political engagement. Its central problematic is the question of how new media forms and technologies engender practices of spectatorship and consumption and how these practices mediate new forms of political activities. Topics of discussion will include spectatorial practice between cinema and animation, media convergence and participatory culture, intersections of gender/sexuality and fan practice, fan work as immaterial labor, politics of world-making, etc.		
HUMA 5690	Major Issues in the History of U.S.-China Relations	3-0-0:3
This course examines the historical origins and evolution of the complex relations between China and the United States from the early 19th century to the late 20th century. It explores some of the most important events and persistent issues in political, military, economic, and cultural relations between the two countries. It also introduces students to major competing interpretations by American and Chinese scholars. **[C]**		
HUMA 5692	The Scientific Revolution (1450 to 1750)	3-0-0:3
This postgraduate course explores the scientific revolution in early modern Europe, examining the cultural and intellectual framework in which new discoveries were made, the shift towards a mathematic vision of the world, and the development of new experimental techniques. Through the comparison with other intellectual traditions, especially the Chinese scientific tradition, students will gain a deeper understanding of the scientific revolution and its impact on modern science and the modern world. The course aims to develop students' analytical and communication skills, as well as their understanding of early modern intellectual history.		
HUMA 5697	Animals and Society: Biodiversity, Conservation, and Ethics	3-0-0:3
This course introduces students to human-animal issues such as preserving biodiversity, the wildlife trade, zoonotic diseases, animals as food and medicine, and living with animals in an urban setting. It will also provide a broad historical overview of the animal rights and conservation movements, drawing upon case studies from the US, China, and elsewhere. As this is a postgraduate-level course, students will critically engage with key concepts (biodiversity, animal ethics, etc.), and will also be encouraged to explore new ideas and methodologies for conducting research in human-animal relationships.		
HUMA 5701	Culture, Psychiatry and Mental Illness	2-1-0:3
Situated at the intersection of cultural psychiatry, medical anthropology and philosophy of mind, the course delves into the cultural foundations of mental illness and its diverse conceptualizations across		

societies. Beginning with a critical look at the current crisis in modern psychiatry, it extends our inquiry to a wide range of healing traditions that fall outside the biomedical paradigm. It considers both the spiritual and sociopolitical dimensions of these traditions, with a key focus on their efficacy. By placing modern psychiatry in a refined comparative perspective, the course aims to assess the therapeutic value of alternative medical philosophies and the potential they hold in illuminating the nature of mental illness and healing. Background: A familiarity with social science and humanities, particularly social anthropology, is highly desirable but not necessary.		
HUMA 5755	Ethnicity in Chinese Context	3-0-0:3
This course explores the issue of ethnicity in China in the context of a nation-state. Issues of nationalism, ethnic identities, and ethnic diversity will be examined from anthropological perspectives.		
HUMA 5800	Fundamentals of Chinese Philosophy	3-0-0:3
This course is designed to guide students to in-depth researches into important issues in Chinese philosophy. The subject matter of the course may vary from one year to another depending on the particular interests of the instructors. **[PU][C]** Exclusion(s): HMMA 5007		
HUMA 5902	Philosophy of Biology	3-0-0:3
This module will provide students with the opportunity to become involved in contemporary issues in the philosophy of biology. The students will be provided an overview of the history of the biological sciences (especially evolutionary biology and genetics). In addition, the module will cover some of the central issues in the philosophy of biology, including reductionism, scientific change, level of selection, design and creationism, and examine some important concepts in the life sciences such as ‘gene’, ‘species’, and ‘causation’. Background: Students are expected to have some background in the humanities (e.g. philosophy) and natural sciences (e.g. biology).		
HUMA 5950	Issues in East Asian Popular Music	3-0-0:3
In different parts of the world, the production, consumption, and distribution of popular music are shaped by a society's distinct encounter with modernity and cultural-specific ways of negotiating it. This course will look at various popular music genres in China, Japan, and Korea, and explore issues related to the emergence of each one and their localized meanings using insights and methods from various modes of theoretical analysis.		

LIFS

LIFS 5710	Cellular Regulation	3-0-0:3
Molecular basis of cellular regulation. Cellular signal transduction cascades.		

MARK

MARK 5710	Analytical Modeling in Marketing	3-0-0:3
[Previous Course Code: MARK 6900Z] This course provides Marketing MPhil/PhD students with foundational knowledge in quantitative marketing, with a focus on analytical modeling. It will cover a range of theoretical topics including pricing, advertising, two-sided markets, consumer search and learning, and information design.		

MATH

MATH 5111	Advanced Algebra I	3-0-0:3
Advanced theory of groups, linear algebra, rings, modules, and fields, including Galois theory. Background: MATH 3121 and MATH 4121 (prior to 2014-15)		
MATH 5240	Algebraic Topology	3-0-0:3
Fundamental group, covering space, Van Kampen theorem, (relative) homology, exact sequences of homology, Mayer-Vietoris sequence, excision theorem, Betti numbers and Euler characteristic.		
MATH 5251	Algebraic Geometry I	3-0-0:3
Projective spaces, algebraic curves, divisors, line bundles, algebraic varieties, coherent sheaves, schemes. Some commumative algebra and homological algebra such as notherian ring, regular ring, valuation ring, kahler differentials. Background: MATH 5111 or equivalent postgraduate algebra		
MATH 5285	Applied Analysis	3-0-0:3
[Previous Course Code: MATH 6050B] Contraction mapping theorem, Fourier series, Fourier transforms, Basics of Hilbert Space theory, Operator theory in Hilbert Spaces, Basics of Banach space theory, Convex analysis. Background: Undergraduate course of multivariable calculus, linear algebra, and real analysis		
MATH 5311	Advanced Numerical Methods I	3-0-0:3
Numerical solution of differential equations, finite difference method, finite element methods, spectral methods and boundary integral methods. Basic theory of convergence, stability and error estimates.		
MATH 5350	Computational Fluid Dynamics for Inviscid Flows	3-0-0:3
Derivation of the Navier-Strokes equations; the Euler equations; Lagriangian vs. Eulerian methods of description; nonlinear hyperbolic conservation laws; characteristics and Riemann invariants; classification of discontinuity; weak solutions and entropy condition; Riemann problem; CFL condition; Godunov method; artificial dissipation; TVD methods; and random choice method.		
MATH 5351	Mathematical Methods in Science and Engineering I	3-0-0:3
Modeling and analytical solution methods of nonlinear partial differential equations (PDEs). Topics include: derivation of conservation laws and constitutive equations, well-posedness, traveling wave solutions, method of characteristics, shocks and rarefaction solutions, weak solutions to hyperbolic equations, hyperbolic Systems, linear stability analysis, weakly nonlinear approximation, similarity methods, calculus of variations.		
MATH 5411	Advanced Probability Theory I	3-0-0:3
Probability spaces and random variables, distribution functions, expectations and moments, independence, convergence concepts, law of large numbers and random series.		
MATH 5431	Advanced Mathematical Statistics I	3-0-0:3
Theory of statistical inference in estimation. Topics include: sufficiency, ancillary statistics, completeness, UMVU estimators, information inequality, efficiency, asymptotic maximum likelihood theory. Other topics may include Bayes estimation and conditional inference.		
MATH 5472	Computer Age Statistical Inference with Applications	3-0-0:3
[Previous Course Code: MATH 6450E] This course is designed for RPg students in applied mathematics, statistics, and engineering who are interested in learning from data. It covers advanced topics in statistical learning and inference, with emphasis on the integration of statistical models and algorithms for statistical		

inference. This course aims to first make connections among classical topics, and then move forward to modern topics, including statistical view of deep learning. Various applications will be discussed, such as computer vision, human genetics, and text mining.

MECH

MECH 5010	Foundation of Solid Mechanics	3-0-0:3
Continuum concept for deformation of solids; analysis of stress and strain; constitutive equations; solution of problems relevant to materials processing, fracture mechanics and structural analysis; energy methods and numerical solutions. Background: MECH 3020 Exclusion(s): MESF 5010		
MECH 5940	Continuum Mechanics for Crystalline Solids	3-0-0:3
[Previous Course Code: MECH 6910Q] This is an interdisciplinary course covering the fundamental laws of the mechanics and physics of crystalline solids, the general description of a periodic structure and their specific characterization methods. The course will start with tensor analysis, and basic calculations of tensor fields. After that, basic kinematics such as deformation gradient, Cauchy-Green tensor will be introduced and defined, followed by the mathematical description of symmetry of crystals. Finally, the course will discuss reciprocal lattices and the X-ray diffraction for structural solving. Background: Solid mechanics related courses. Basic symmetry knowledge. Linear algebra and multivariable calculus		
MECH 5961	Acoustics and Aeroacoustics	3-0-0:3
[Previous Course Code: MECH 6910L] The aims of this module are to acquaint students with the knowledge of acoustics and aerodynamically generated sound, its generation either through turbulent flow or unsteady aerodynamic force-surface interaction, and numerical methods for accurate numerical prediction of aerodynamically generated noise as well as its propagation and far-field characteristics. The wide applications of the subject are noise, environmental impact of noise and transport related noise. Exclusion(s): AESF 5390 (prior to 2021-22) Prerequisite(s): MECH 3640		
MECH 6910T	Data-Driven Modeling and Control of Dynamic Systems	3-0-0:3
Data-driven discovery is currently revolutionizing how we model, predict, and control complex nonlinear dynamic systems. This course aims to discuss many existing data-driven tools and their application in the modeling and control in mechanical engineering applications. Representative data-driven methods, including supervised/unsupervised learning, reinforcement learning, balanced truncation, proper orthogonal decomposition, principal component analysis, etc., will be introduced with particular case studies. The course aims to help the students to develop a data-driven perspective to analyze and control nonlinear and complex dynamic systems, in addition to conventional physics-based models and linear control theories. The students will have the opportunity to have individual course projects to practice the data-driven modeling and control methods introduced in the class. Background: MECH 3610		

MGMT

MGMT 6501N	Frontiers in Strategy Research	3-0-0:3
This course is designed as a seminar discussion that provides an overview of some of the most contemporary research topics in strategic management. We will survey a select set of strategy topics including ESG and sustainability, global strategy, corporate governance, innovation models, digital economy, mergers and acquisitions, and global value chains. Through in-depth and in-class discussion of		

some of the cutting edge research in the field of strategic management, we focus on developing ideas for a research proposal in terms of theory development and research design.		
MGMT 7120	Doctoral Seminar in Management	3-0-0:3
Presentations and discussions of current research topics in Organizational Behavior and Human Resources Management for doctoral students.		

PHYS

PHYS 5110	Mathematical Methods in Physics	4-0-0:4
Review of vector analysis; complex variable theory, Cauchy-Rieman conditions, complex Taylor and Laurent series, Cauchy integral formula and residue techniques, conformal mapping; Fourier series; Fourier and Laplace transforms; ordinary differential equations, Bessel functions; partial differential equations, wave and diffusion equations, Laplace, Helmholtz and Poisson's equations, transform techniques, Green's functions; integral equations, Fredholm equations, kernals; Rieman sheets, method of steepest descent; tensors, contravariant and covariant representations; group theory, matrix representations.		
PHYS 5200	Electro and Magneto Statics	4-0-0:4
Coulomb and Gauss's law, Poisson and Laplace Equations, Green's functions, methods of images, solution of boundary value problems, special functions expansions, electrostatics of dielectrics, local fields, magnetostatics, conservation laws and Maxwell equations.		
PHYS 5260	Advanced Quantum Mechanics	4-0-0:4
Discussion of various applications of quantum mechanics, such as collision theory, theory of spectra of atoms and molecules, theory of solids, second quantization, emission of radiation, relativistic quantum mechanics.		
PHYS 5520	Introduction to Quantum Field Theory	4-0-0:4
[Previous Course Code: PHYS 6810D] This is an introductory course on quantum field theory (QFT). The covered topics mainly include field quantization, interacting theory, quantum electrodynamics, renormalization and renormalization group. Background: Undergraduate level classical mechanics, electrodynamics and quantum mechanics. Exclusion(s): PHYS 6810K		
PHYS 5820	Diffraction and Imaging Techniques in Materials Science	3-1-0:3
[Co-list with NANO 5250] Fundamental crystallography; crystalline structure and defects; X-ray and electron diffractions; imaging contrast mechanisms; structure determination; analytical electron microscopy. The instructor's approval is required for taking this course. Exclusion(s): NANO 5250		

SOSC

SOSC 6030R	Experiments and Quasi-experiments in the Social Sciences	3-0-0:3
This course explores the statistical methods used for causal inference in the social sciences within the potential outcomes framework. Using this perspective puts the logic of statistical inference for both experimental and non-experimental studies within the same framework. Though randomized experiments serve as the gold standard for causal inference, the course also outlines how it may sometimes be		

reasonable to treat non-experimental data as if it had been drawn from an experiment. Usually, this involves a set of assumptions or substantive factual information about how the natural world produced the data. Research designs and methods covered include randomized experiments, matching, instrumental variables, difference-in-differences, synthetic control, and regression discontinuity designs.		
SOSC 6030S	Seminar in Cognitive Science	3-0-0:3
This course aims to introduce current issues in Cognitive Science to postgraduate students. Cognitive Science is the interdisciplinary, scientific study of the mind and mental phenomena, encompassing Artificial Intelligence, Psychology, Linguistics, Neuroscience, Philosophy, Anthropology, and Education. At each week's class, we will read and discuss research papers from major Cognitive Science journals including Trends in Cognitive Science and Topics in Cognitive Science, or other related interdisciplinary journals. This course is open to all graduate students who are interested in learning more about interdisciplinary studies on the mind and behaviour.		

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