Description of Postgraduate Courses -- Research Postgraduate Course Sharing Scheme (Spring Term 2025-2026)

Last Update: 29 January 2026

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.

AMCC

AMCC 6500G	Video Generation	3-0-0:3
This course focuses on the emerging field of video generation, an intersection of computer vision, machine learning, and digital creativity. Students will explore state-of-the-art models and methodologies for generating, synthesizing, and editing videos using deep learning, including autoregressive transformers, diffusion models, and multimodal architectures. The course integrates theoretical understanding, hands-		

on experimentation, and creative applications, preparing students to contribute to next-generation visual AI systems for art, film, gaming, and interactive media.

CHEM

CHEM 5130	Asymmetric Catalysis	3-0-0:3
This course teaches the basic concepts and general modes of action of asymmetric catalysis and synthesis. Asymmetric catalysis is an essential tool in organic synthesis, which is used daily in various industries, such as pharmaceutical, chemical, agriculture, materials, etc. The course will provide in-depth explanation of how catalysts work in organic reactions and how asymmetric control is accomplished in different scenarios. Lectures will focus on mechanistic details of chirality control using case studies. Students are expected to be able to use this important tool to solve various synthetic problems. Background: Students are expected to have solid knowledge of organic chemistry, especially common reaction mechanisms, for example, CHEM 3120 Organic Chemistry II with a grade of B+ or higher, or equivalent.		
CHEM 5140	Chemical Biology	3-0-0:3
This course is designed to expose students to current methodologies in the field of Chemical Biology. A key focus will be the chemical reactions and probes that have been used to build current techniques in the field. Areas that will be covered include bio-orthogonal chemistry, protein engineering, methods of protein- and cell-specific labelling, biological assay development, cell imaging techniques, and topics in current Chemical Biology research.		
CHEM 6030D	Electrochemistry and Electrochemical Engineering	3-0-0:3
Fundamental principles of electrochemistry such as Nernst and Bulter-Volmer equations and their applications in energy devices, materials fabrications, and analytical methods.		

CIVL

CIVL 5210	Principles of Project Finance	3-0-0:3
In-depth discussion of principles, techniques, and models of project finance in capital-intensive infrastructure projects, including international infrastructure markets; project bankability; project agreement and ancillary contracts; risk analysis and management; financial structuring, modeling and evaluation; outsourcing; case studies of various public-private partnerships in infrastructure development.		
CIVL 5430	Aquatic Chemistry	3-0-0:3
Chemistry applied to reactions occurring in water and wastewater, includes inorganic solution chemistry, chemical equilibrium, acids/bases, coordination chemistry, chemical kinetics, colloid chemistry, solubility and precipitation, oxidation-reduction potential. Prerequisite(s): CIVL 2410		
CIVL 5510	Hydroclimate Data Analysis and Modelling	3-0-0:3
[Previous Course Code: CIVL 6100K] This course provides a foundation for data analysis and statistics-aided physical diagnosis in water and climate related studies. Students will have a fundamental understanding of why climate and water research needs the assistance of statistics and probabilities. The course will cover topics including robust and resistant statistics, conditional climatology and persistence analysis,		

parametric probability distribution, spatiotemporal analysis, and visualization etc. with real analysis examples.		
CIVL 5530	Turbulence Processes in Hydrosystems	3-0-0:3
[Previous Course Code: CIVL 6100A] An introduction to turbulence, including the nature of turbulence, governing equations of turbulent flow, structure of turbulence, turbulence modeling, experimental measurements of turbulence and an introduction to computational fluid dynamics.		
CIVL 5550	Modeling Fluid Systems	3-0-0:3
The course focuses on the physical processes in fluid systems and their mathematical representation; includes the fundamental laws of classical mechanics and thermodynamics and how these principles are applied to fluid flow problems. The processes of waves and mixing in fluids are emphasized. The type of fluid systems to be studied varies from year to year depending on the students' interest and can range from natural to engineered systems including fluid based renewable energy systems.		
CIVL 5710	Advanced Soil Mechanics	3-0-0:3
Selected topics from recent advances in theoretical and experimental development in soil mechanics; includes stress-strain behavior of soil, consolidation settlement, drained and undrained strength slope stability problems. Background: CIVL 3740		
CIVL 5720	Advanced Foundation Design	3-0-0:3
Current practice of foundation design and analysis; includes design and analysis of bulkheads, deep excavation, tieback systems, tunneling in soft ground, buried conduits, lateral pile loading, pier foundations. Background: CIVL 3740 Exclusion(s): CIEM 5720		
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. Exclusion(s): CIEM 5330 (prior to 2024-25)		
CIVL 5840	Advanced Concrete Technology	3-0-0:3
Fundamental concepts (workability, strength, dimension stability, and durability); updated concrete technology (micro structural engineering, development of special concretes); concrete fracture and modeling; nondestructive evaluation methods for concrete structures. Background: CIVL 2120 and CIVL 2810 or equivalent Exclusion(s): CIEM 5240, CIVL 4810		
CIVL 6050O	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.		
CIVL 6100R	Climate Change and Climate Modeling	3-0-0:3
This course describes the physics of the climate system and how it is represented in numerical models. It covers global environmental issues related to climate change resulting from both human activities and natural climate variations, and introduces the basic structures of climate models. This course aims to equip students with a solid understanding of the physical climate system and the underlying principles of current climate assessments. It teaches students which aspects of climate science are well understood and where		

quantitative uncertainties arise. As climate models are one of our primary tools for predicting and adapting to climate change, it is vital that we appreciate their strengths and limitations. The course includes a combination of lectures, homework assignments, a mid-term exam, and a term project of climate model analysis. The lectures provide students with fundamental knowledge of the physical processes in the climate system and basics of climate modeling. Homework assignments reinforce the knowledge base and enhance problem-solving skills for students. The mid-term exam will assess the learning outcome. The term project provides hands-on training on utilizing climate models to understand climate change and make informed decisions.		
CIVL 6100S	Introduction to Uncertainty Quantification	3-0-0:3
The aim of the course is to introduce the students to some of the methods and algorithms used in uncertainty quantification (UQ), and let the students experience these methods on elementary computer experiments. It covers several topics in UQ: uncertainty parametrization, uncertainty propagation, sensitivity analysis, inference and uncertainty reduction. Related methods (e.g. Monte Carlo simulation, spectral decompositions, surrogate modeling, Bayesian inference, Gaussian models) will be reviewed and some of them illustrated during computer experiments and projects. Instructor's consent is required for enrollment.		

COMP

COMP 5111	Fundamentals of Software Testing and Analysis	3-0-0:3
The goal of this course is to introduce how various analysis techniques can be used to manage the quality of a software application. Students will acquire fundamental knowledge of program abstraction, features, verification, testing, refactoring, concurrency, reliability, aspect orientation, and fault analysis. The course will also discuss how to carry out the empirical experimentation for program analysis. Wherever applicable, concepts will be complemented by tools developed in academia and industry. This enables students to understand the maturity and limitations of various analysis techniques.		
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): ARIN 5103, CSIT 5910, MAIE 5212, MSBD 5012		
COMP 5214	Advanced Deep Learning Architectures	3-0-0:3
[Co-list with ELEC 5680] [Previous Course Code: COMP 6211D] This course focuses on advanced deep learning architectures and their applications in various areas. Specifically, the topics include various deep neural network architectures with applications in computer vision, signal processing, graph analysis, and natural language processing. Different state-of-the-art neural network models will be introduced, including graph neural networks, normalizing flows, point cloud models, sparse convolutions, and neural architecture search. The students have the opportunities to implement deep learning models for some AI-related tasks such as visual perception, image processing and generation, graph processing, speech enhancement, sentiment classification, and novel view synthesis. Exclusion(s): ELEC 5680		
COMP 5311	Database Architecture and Implementation	3-0-0:3
Introduction to the relational model and SQL. System architectures and implementation techniques of database management systems: disk and memory management, access methods, implementation of		

relational operators, query processing and optimization, transaction management and recovery. Hands on experience with building the components of a small DBMS. Background: COMP 3511		
COMP 5421	Computer Vision	3-0-0:3
Introduction to techniques for automatically describing visual data and tools for image analysis; perception of spatial organization; models of general purpose vision systems; computational and psychological models of perception. Background: COMP 3211; knowledge in linear algebra Exclusion(s): ARIN 5201, MAIE 5421		
COMP 5422	Deep 2D and 3D Visual Scene Understanding	3-0-0:3
[Previous Course Code: COMP 6411B] Visual scene understanding is an important and fundamental field for advanced application scenarios such as self-driving, robotics, and AR/VR. This course majorly focuses on delivering deep learning-based visual scene understanding techniques in both 2D and 3D perspectives. In the 2D part, it introduces topics including image and scene classification, semantic segmentation, and object detection/tracking. In the 3D part, it delivers how 3D scene understanding can be performed through learning from 2D images, point clouds or multi-modal data, involving topics such as scene depth estimation, camera pose prediction, 3D scene reconstruction, and visual SLAM. Representative deep scene understanding architectures and frameworks in supervised, self-supervised, and open-world learning settings will also be introduced. Background: Basic knowledge about computer vision and deep learning fundamentals		
COMP 5423	Deep Learning for Medical Image Analysis	3-0-0:3
[Previous Course Code: COMP 6211H] Nowadays medical image analysis is rapidly growing and plays an indispensable role in healthcare. Recent advances of deep learning techniques have made significant breakthroughs in medical image analysis applications. This course will cover fundamental knowledge of medical imaging and various medical image analysis tasks, including computer-aided detection, segmentation, diagnosis and prognosis. Deep learning methods for solving these tasks will be introduced and state-of-the-art methods will be discussed. The remaining significant challenges and limitations will also be presented, including limited amount of labeled data, deep learning with interpretation and generalization issues, etc. This course will equip students with practical knowledge of medical imaging and analysis with deep learning techniques. Background: Basic knowledge about image processing and machine learning are beneficial Exclusion(s): ARIN 5302, BEHI 5011		
COMP 5631	Cryptography and Security	3-0-0:3
Classical encryption techniques, block and stream ciphers, public-key cryptography, authentication, nonrepudiation, key management, digital signatures, public key infrastructure, cryptographic protocol, secret sharing, electronic mail security, IP security, Web security, Firewalls, Intrusion detection. Background: Computer networks Exclusion(s): CSIT 5710		
COMP 5911	Entrepreneurial Me	3-0-0:3
[Previous Course Code: COMP 6613D] While entrepreneurship is a career choice, its mindset is for everyone. This is a course covering the mindset and elements of founding new and innovative business ventures in information technology sector. Topics include the entrepreneurial risk-taking value-creation mindset, market identification and go-to-market strategies, business models and development, business plan, fundraising and investment, role and protection of intellectual properties, technology-market gap and product-market fit, and growth and exit strategies. Case studies of successful and unsuccessful ventures will be discussed. In-class student participation and presentation are expected. Business and non-engineering students interested in starting IT-related companies are also welcome. Research postgraduate students are encouraged to develop proof-of-concept prototypes and business plans based on their		

research findings. Exclusion(s): MAIE 5534		
COMP 6211L	Hardware-Aware Deep Learning Computing	3-0-0:3
This course introduces advanced topics at the intersection of deep learning and computer architecture, emphasizing hardware-aware perspectives for understanding and improving computation in deep learning applications. It covers principles of performance and efficiency evaluation, model optimization techniques such as quantization and pruning, and emerging hardware architectures that enable efficient execution of deep learning workloads. The course further examines how hardware characteristics can inspire algorithm design, and how deep learning methods can, in turn, contribute to hardware and system innovation. Through lectures, paper discussions, and project work, students will develop the ability to critically analyze and compare hardware-aware deep learning system designs.		

ECON

ECON 6121C	Long-Run Economic Growth	4-0-0:4
This course examines competing explanations for long-run differences in development and economic growth, asking the central question: Why are some countries so rich while others remain poor? We approach this question from a historical and comparative perspective, tracing the evolution of economies from the Middle Ages through the twentieth century. Although we emphasize Britain and Northwestern Europe - where sustained economic growth first emerged - we also study historical experiences in Asia, Latin America, and Africa. Prior exposure to the core analytical and empirical tools from first-year graduate coursework in microeconomics and macroeconomics is strongly recommended. The course has several objectives. First, it demonstrates how theoretical frameworks and quantitative methods can be applied to historical evidence. Second, it introduces students to research and academic writing in related applied fields. To this end, we will read and discuss research articles to understand how economic history scholarship is constructed. Students will also have multiple opportunities to develop their own research questions, present ideas, and engage actively with the material.		
ECON 6121F	Advances in International Trade	4-0-0:4
Introducing key concepts in the study of international trade and investment, the course covers both the forces that determine international trade flows and how they impact domestic economies. The course will also examine the economics of international knowledge flows.		

ELEC

ELEC 5050	Advanced CMOS Devices	3-0-0:3
Principles and characteristics of semiconductor devices found in State-of-the-Art ICs. Emphasis is on deep-submicron MOS device design, characterization and modeling. Important issues such as short channel effects, high-field behavior, hot carrier effects, reliability and device scaling for present and future technology will be covered. Prerequisite(s): ELEC 3500		
ELEC 5140	Advanced Computer Architecture	3-0-0:3
[Previous Course Code: ELEC 6910K] The course introduces the important building blocks in modern computing systems including superscalar processor pipeline, memory hierarchies, network design in the multicore-processors. The design techniques, evaluation metrics and optimization techniques will be		

discussed in detail with the example of real computer systems. The students will gain not only theoretical knowledge through lectures, but also hands-on experiences through projects. Background: Background knowledge in ELEC 2300 (Computer Organization) or COMP 2611 (Computer Organization)		
ELEC 5150	21st Century Solid-State Devices: From Principles to Applications	3-0-0:3
[Previous Course Code: ELEC 6910Z] This course provides a comprehensive survey of solid-state devices developed after 2000. Topics include advanced thin-film device physics, next-generation transistors, perovskite and organic photovoltaics (including tandem configurations), memristors, in-memory computing, and sensors/organic electrochemical transistors. The course places a strong emphasis on quantitative electrical characterizations and luminescent measurement techniques, model-based reasoning, reliability and variability assessments, and device-system co-design, particularly for applications in displays, imaging, and energy.		
ELEC 5160	Digital VLSI System Design and Design Automation	3-0-0:3
Structured design styles; specification, synthesis and simulation using Hardware Descriptive Language (HDL); Structural chip design and system design; Circuit design of system building blocks: arithmetic unit, memory systems; clocking and performance issues in system design; Design-Automation tools and their applications. Background: ELEC 2200 Exclusion(s): EESM 5020 Prerequisite(s): ELEC 3410		
ELEC 5210	Advanced Topics in Nanoelectronics	3-0-0:3
Introduction to state-of-the-art development in the broad area of nanoelectronics, including concepts and devices for spin electronics and quantum information science. Students are expected to demonstrate the capability of applying fundamental principles to understand advanced electronic devices through hands-on homework projects. Background: ELEC 4510		
ELEC 5240	Advanced Display Technologies	3-0-0:3
[Previous Course Code: ELEC 6910V] Introduction of the human visual system, Colorimetry and photometry, Introduction of the modern TFTs, Modern AMLCD, AMOLED, Fluorescence and phosphorescence, Introduction of Electrophoretic displays, Color electrophoretic displays, Nano-material for displays, Electroluminescence and Photoluminescence, Quantum dot, Quantum rods, State-of-the-art development in the area of display technology: High-resolution displays (4k, 8k, and 10k), Local backlight dimming, Introduction to AR/VR display solutions, Holographic displays, Flexible displays etc. Background: Basic understanding of calculus and algebra.		
ELEC 5280	High Frequency Circuit Design	3-0-0:3
High frequency circuit design for wireless applications. S-parameters, front-end amp, VCO, PLL, power amplifier, and integration issues will be covered. Background: ELEC 3100, ELEC 3400, ELEC 4180 and ELEC 4630		
ELEC 5460	Stochastic Optimization for Wireless Systems and Federated-Learning	3-0-0:3
Stochastic Optimization plays a critical role in radio resource optimization of wireless networks, optimal control theory as well as financial engineering (portfolio optimization). This course will focus on the stochastic optimization theory and the application to the design and optimization of next generation wireless systems and federated learning applications. Topics covered include (A) Physical Layer Modeling: review of information theory for wireless fading channels, MIMO spatial diversity and spatial multiplexing, (B) Theory of Stochastic Optimization: classifications and motivating examples of stochastic optimizations [Type I stochastic Optimization and Type II stochastic optimization problems], theory of Stochastic Approximation, Stochastic Gradient, (C) Applications of Type I SO: Robust optimizations and Federated		

Learning: (D) Applications of Type II SO: Markov Decision Process, Stochastic Stability and Delay-optimal wireless resource control. Background: ELEC 4110 or equivalent		
ELEC 5550	Electronic Design Automation for VLSI Design	3-0-0:3
[Previous Course Code: ELEC 6910D] The course introduces Electronic Design Automation (EDA) techniques for VLSI digital IC design. The modern RTL to GDS-II design flow and related tools will be explained in detail. Classical automated algorithms adopted in logic synthesis, floorplanning, placement, clock tree synthesis (CTS), routing, etc. will be covered. Simulation and optimization techniques of key IC design objectives, including recent research on AI-assisted EDA, will be presented. Background: Basic knowledge on data structure and algorithms and digital logic design		
ELEC 5640	Robot Manipulation	3-0-0:3
[Co-list with MECH 5561] Extensive introduction to robot manipulation theory from a geometric viewpoint. Rigid-body kinematics; spatial and body representation of rigid-body velocities; coordinate transformations; forward kinematics of open-chain manipulators; solution of inverse kinematics; robot workspaces; nonlinear decoupling control and force control. Exclusion(s): MECH 5561		
ELEC 5650	Introduction to Networked Sensing, Estimation and Control	3-0-0:3
[Previous Course Code: ELEC 6910E] The course gives an introduction to the analysis and design of sensing, estimation and control systems in a networked setting. It consists of three parts: the first part introduces necessary background knowledge in communication networks, sensor networks, linear state estimation, MAP and ML estimators, Kalman filtering, and modern control theory; the second part focuses on analysis of network effect to remote state estimation and control; the third part presents some advanced topics including distributed state estimation and resource allocation through scheduling. Background: ELEC 2600 AND ELEC 3200		
ELEC 5660	Introduction to Aerial Robotics	3-0-3:3
[Previous Course Code: ELEC 6910P] This course gives a comprehensive introduction to aerial robots. The goal of this course is to expose students to relevant mathematical foundations and algorithms, and train them to develop real-time software modules for aerial robotic systems. Topics to be covered include rigid-body dynamics, system modeling, control, trajectory planning, sensor fusion, and vision-based state estimation. Students will complete a series of projects which combine into an aerial robot that is capable of vision-based autonomous indoor navigation. Background: Linear algebra; Probability; MATLAB programming skills; C++ programming skills		
ELEC 5680	Advanced Deep Learning Architectures	3-0-0:3
[Co-list with COMP 5214] [Previous Course Code: ELEC 6910T] This course focuses on advanced deep learning architectures and their applications in various areas. Specifically, the topics include various deep neural network architectures with applications in computer vision, signal processing, graph analysis, and natural language processing. Different state-of-the-art neural network models will be introduced, including graph neural networks, normalizing flows, point cloud models, sparse convolutions, and neural architecture search. The students have the opportunities to implement deep learning models for some AI-related tasks such as visual perception, image processing and generation, graph processing, speech enhancement, sentiment classification, and novel view synthesis. Exclusion(s): COMP 5214		
ELEC 5810	Introduction to Bioinformatics Algorithms	3-0-0:3

This is an introductory course on computational biology at the molecular level. It will cover basic biological knowledge, important biological questions, common data acquisition techniques, popular data analysis algorithms and their applications. The major content of this course is computation-oriented.		
ELEC 5820	Microfluidics and Biosensors	3-0-0:3
[Co-list with BIEN 5820] [Previous Course Code: ELEC 6910D] Introduction to Microfluidics and Biosensors; Overview of microfabrication materials & techniques; microfluidic principles; miniaturized biosensors; micro total analysis system (μTAS) & lab-on-a-chip (LOC) for clinical and research applications. Background: Basic Physics Exclusion(s): BIEN 5820		
ELEC 5900	Modern Engineering Research Methodologies	3-0-0:3
The course provides a high-level description of modern engineering research practices. It covers topics including research mentality, the scientific method, evaluating research topics, literature search, report writing, presenting data, publication, research management, research ethics and technology transfer. Exclusion(s): EESM 5770 (prior to 2025-26), EESM 5830		
ELEC 6910E	Compound Semiconductor Device Physics and Technologies	3-0-0:3
This course covers the physics and technologies of compound semiconductor devices, stressing how differences from silicon enable unique applications in wireless communications, power switching, photovoltaics, and solid-state lighting. Electronic bandstructures will be used to develop band diagrams of complex heterostructures and nanostructures. Examples in electronic and photonic applications will be used to motivate the materials science of crystal growth, doping, and fabrication. Prerequisite(s): ELEC 4510		
ELEC 6910I	Internet Video Streaming	3-0-0:3
This course will introduce how YouTube, Zoom, cloud gaming, VR, and many video streaming applications work.		

ENEG

ENEG 5400	Transport Phenomena and Its Application in Energy Systems	3-0-0:3
[Co-list with MECH 5280] Elementary statistical concepts; ensembles and postulates; partition functions and their properties; calculation of thermodynamic properties; kinetic theory of transport process; fluctuation-dissipation theorem; Langevin equation; mass and heat transfer in fuel cells. Exclusion(s): MECH 5280		

HUMA

HUMA 5160	Chinese Phonetics and Phonology	3-0-0:3
This course is an introduction to the study of sounds in Mandarin Chinese. The course will cover fundamental concepts in phonetics and phonology and compare the sounds of Mandarin with those of other languages. Other topics include: methodology, the typology, learning and evolution of sounds, the subgrouping of Chinese dialects, etc. **[Pu][C]** Exclusion(s): HMMA 5002		
HUMA 5230	Languages of China: Anthropological and Cognitive Dimensions	3-0-0:3

A cross-disciplinary discussion of issues pertaining to social, historical, cultural, and cognitive aspects of languages and dialects of China, approached from perspectives of areal linguistics, linguistic anthropology, and cognitive linguistics. **[Pu][C]** Exclusion(s): HMMA 5008		
HUMA 5342	Sentimental Republic: Emotion in Modern Chinese Literature	3-0-0:3
[Previous Course Code: HUMA 6001B] This course takes an interdisciplinary approach to the study of Chinese literature and culture from the late Qing to the Republican era, focusing on the expression and representation of emotion and affect. Linking literature to other cultural and political discourses of the late nineteenth and early twentieth centuries, we will examine the social and cultural significance of modern Chinese sentimentalism. The course will broadly address issues such as public/private sentiment, sympathy and empathy, translations of emotions, reformulations of the senses (sight, hearing, smell, taste and touch), suffering and trauma, negative emotions (e.g. shame, anger and grief), and the gendering of the public sphere. **[C]**		
HUMA 5351	Critical Film and Media Theory	3-0-0:3
This course will revolve around discussions of contemporary media theories, ranging from foundational texts on apparatus theory to more recent approaches to newer forms of digital media. Beginning with approaches to early cinema as our point of departure, we will take up a range of questions revolving around debates around technology and history, gender and affect, national and oppositional cinema, and animation and new media.		
HUMA 5541	History and the Future	3-0-0:3
Can our knowledge of the past help us to predict the future? What kinds of lessons can we learn from history? What is the value of history for life, anyway? This course investigates both the philosophical and practical issues associated with studying the past in order to make judgments about the future. The course adopts an interdisciplinary perspective that draws from history, philosophy, political science, sociology, grand strategy, psychology, and physics. Readings include Thucydides, Han Fei, Hegel, Clausewitz, Weber, Arendt, and Nietzsche, as well as contemporary literature on chaos theory, comparative politics, historical sociology, and cliodynamics.		
HUMA 5700	Anthropological Studies of China	3-0-0:3
[Previous Course Code: HUMA 5540] Anthropological consideration of Chinese culture and society. Special topics in Chinese anthropological studies, such as kinship, ethnicity, religion, and regional system. **[C]** Exclusion(s): HMMA 5006		
HUMA 5905	Science and Values	0-3-0:3
This is an advanced module in the history and philosophy of science. We will read and evaluate the most important contemporary and historical texts, from history, philosophy and sociology, that discuss both the values central to a scientific life and the role of values in the scientific enterprise. The different positions on the relation between science and values will also be situated within the changing relation between science and society in the modern period, with a special attention to the second half of the 20th century, particularly the construction of the atom bomb in the context of the Second World War and the increased importance of risk assessment in modern societies through scientific research.		
HUMA 5930	Classical Chinese Philosophy	3-0-0:3
This course examines the intellectual development of early Chinese by focusing on four major schools: Confucianism, Mohism, Daoism, and Legalism. This course will introduce representative philosophers in ancient China, such as Confucius, Mozi, Laozi, Zhuangzi, Xunzi, Hanfeizi, and Mencius. We will explore their		

thoughts in ethics, human nature, metaphysics, and self-cultivation. We will read translations of major texts with commentaries and interpretations.		
HUMA 5951	Music, Science, and the Sublime	3-0-0:3
In this class, we inspect the overlapping domains of music, mysticism, and the pursuit of knowledge in Western cultural history. What do the beliefs and theories of the past tell us about our relationship to music? What does music tell us about being human and of the world we inhabit? In an effort to answer these questions, we will be discussing topics ranging from psychoacoustics and generative AI to celestial harmonies and birdsong, as well as listening to repertoire spanning from ancient Greek compositions to tracks by contemporary computational artists. Exclusion(s): MGCS 5038 (prior to 2025-26)		

MARK

MARK 5410	Seminar in Quantitative Modeling	3-0-0:3
Overview of the literature on modeling marketing phenomena.		

MATH

MATH 5112	Advanced Algebra II	3-0-0:3
Advanced topics in algebra: group representations, associative algebras, commutative algebra, homological algebra, algebraic number theory. Background: MATH 5111		
MATH 5143	Introduction to Lie Algebras	3-0-0:3
Lie algebras. Nilpotent, solvable and semisimple Lie algebras. Universal enveloping algebras and PBW-theorem. Cartan subalgebras. Roots system, Weyl group, and Dynkin diagram. Classification of semisimple Lie algebras. Representations of semisimple algebras. Weyl character formula. Harish-Chandra isomorphism theorem. Prerequisite(s): MATH 2131 and MATH 3131		
MATH 5261	Algebraic Geometry II	3-0-0:3
Derived functors, cohomology of coherent sheaves on schemes, extension groups of sheaves, higher direct image of sheaves, Serre duality, flat morphisms, smooth morphisms, and semi-continuity, basics of curves and surfaces. Background: MATH 5111 or equivalent postgraduate algebra Prerequisite(s): MATH 5251		
MATH 5312	Advanced Numerical Methods II	3-0-0:3
Direct and iterative methods. Programming techniques and softwares libraries. Sparse solvers, Fast algorithms, multi-grid and domain decomposition techniques. Prerequisite(s): MATH 5311		
MATH 5353	Multiscale Modeling and Computation for Non-equilibrium Flows	3-0-0:3
[Previous Course Code: MATH 6385D] Introduction of the Navier-Strokes equations and the flow modeling in the hydrodynamic scale. The derivation of the Boltzmann equation in the kinetic scale. The basic mathematical analysis of the Chapman-Enskog expansion and the numerical methods for the Boltzmann equation. The multiscale modeling from the kinetic to the hydrodynamic scales and the discretized		

governing equations. The study of non-equilibrium transport phenomena in gas dynamics, radiative and heat transfer, and plasma physics. Background: Background knowledge in MATH 5350 is preferred		
MATH 5380	Combinatorics	3-0-0:3
Enumerative Combinatorics: bijective counting, permutation statistics, generating functions, partially ordered sets, Mobius inversions, Polya theory. Graph Theory: cycle space, bond space, spanning-tree formulas, matching theory, chromatic polynomials, network flows. Matroid Theory: matroid axioms, representations, duality, lattice of flats, transversals. Background: Linear algebra; Calculus Prerequisite(s): MATH 2343 or MATH 3343		
MATH 5412	Advanced Probability Theory II	3-0-0:3
Stable laws; infinitely divisible distributions; weak convergence on general metric spaces; Donsker's invariance principle; basic martingale theory; optional stopping theorem; martingale convergence theorems; martingale CLT; Concentration inequalities; logarithmic Sobolev inequality; large deviation.		
MATH 5432	Advanced Mathematical Statistics II	3-0-0:3
Theory of statistical inference in hypothesis testing. Topics include: uniformly most powerful tests, unbiasedness, invariance, minimax principle, large-sample parametric significance tests. Concept of decision theory also covered.		
MATH 5460	Time Series Analysis	3-0-0:3
Basic idea of time series analysis in both the time and frequency domains. Topics include: autocorrelation, partial ACF, Box and Jerkins ARIMA modeling, spectrum and periodogram, order selection, diagnostic and forecasting. Real life examples will be used throughout the course.		

MECH

MECH 5280	Transport Phenomena and Its Application in Energy Systems	3-0-0:3
[Co-list with ENEG 5400] Elementary statistical concepts; ensembles and postulates; partition functions and their properties; calculation of thermodynamic properties; kinetic theory of transport process; fluctuation-dissipation theorem; Langevin equation; mass and heat transfer in fuel cells. Exclusion(s): ENEG 5400		
MECH 5320	Convective Heat and Mass Transfer	3-0-0:3
Laminar and turbulent boundary layer heat transfer by similarity, integral and superposition methods; effects of roughness, curvature, transpiration and high turbulence; forced and free convections, free-shear flows and buoyant flows; numerical methods. Background: MECH 3310 Prerequisite(s): MECH 5210		
MECH 5410	Advanced Mechanical Behavior of Materials	3-0-0:3
Relationships between microstructure and mechanical behavior in crystalline materials; temperature-dependent deformation in elasticity, viscosity and creep; embrittlement, fatigue and fracture of engineering materials; strengthening mechanisms in crystalline materials. Background: MECH 3420 Exclusion(s): AESF 5410 (prior to 2025-26), MESF 5410 (prior to 2025-26)		
MECH 5561	Robot Manipulation	3-0-0:3

[Co-list with ELEC 5640] [Previous Course Code: MECH 6910M] Extensive introduction to robot manipulation theory from a geometric viewpoint. Rigid-body kinematics; spatial and body representation of rigid-body velocities; coordinate transformations; forward kinematics of open-chain manipulators; solution of inverse kinematics; robot workspaces; nonlinear decoupling control and force control. Exclusion(s): ELEC 5640		
MECH 6910V	Electrochemistry and Electrochemical Engineering	3-0-0:3
Fundamental principles of electrochemistry such as Nernst and Bulter-Volmer equations and their applications in energy devices, materials fabrications, and analytical methods.		
MECH 6910W	Smart Materials and Sensors	3-0-0:3
Smart Materials, also called intelligent materials, functional materials or adaptive materials, are a new and expanding class of materials that can change their mechanical, electrical, optical, chemical, magnetic, thermal, acoustic properties in response to external stimuli such as temperature, light, pH, voltage, and pressure. They are used in a wide range of applications since they can exceed the current abilities of traditional materials, especially in environments where conditions are constantly changing. One of the major applications lies in sensors, actuators, transducers and energy harvesters. This course is specially designed to provide an integrated and advanced knowledge of smart materials and sensors for PG students. The course will also introduce the state-of-the-art advances in applications of smart materials in sensors, actuators, energy harvesters, acoustic transducers, and microelectronic and mechanical systems. It will also deliver useful programing and simulations skills that can directly benefit your research. The course will lay a strong foundation for your current research and future career in electrical engineering, mechanical engineering, and material chemical engineering.		

MGMT

MGMT 7100	Behavioral Science	3-0-0:3
In-depth study of the foundations of behavioral science research using examples from organizational behavior and other related business disciplines.		

PHYS

PHYS 5170	Solid State Physics I	3-0-0:3
[Co-list with NANO 5140] [Previous Course Code: PHYS 6810A] This is an introductory course on postgraduate level solid state physics. The topics covered include: electronic band structures of solids, phonons, electron dynamics in crystals, electron interactions in solids, linear response theory, electronic transitions and optical properties of solids, electron phonon interactions, integer quantum Hall effects, superconductivity and magnetism. Background: Students should have good understanding in undergraduate level quantum mechanics before taking this course. Exclusion(s): NANO 5140		
PHYS 5310	Statistical Mechanics I	3-0-0:3
[Co-list with NANO 5320] Laws and applications of thermodynamics, kinetic theory, transport phenomena, classical statistical mechanics, canonical and grand canonical ensemble, quantum statistical mechanics, Fermi and Bose systems, non-equilibrium statistical mechanics. Exclusion(s): NANO 5320		

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 5810	Modern Semiconductor Physics	3-0-0:3
[Co-list with NANO 5200] Detailed explanations of the electronic, vibrational, transport, and optical properties of semiconductors based on quantum mechanics. Emphasis on nanostructured heterostructures, quantum size and low-dimensional effects, and application to modern electronics and opto-electronics. Background: PHYS 4052 or equivalent Exclusion(s): NANO 5200		

SOSC

SOSC 5170	Qualitative Research Methods	3-0-0:3
This course explores links between theory and practice in qualitative research. It combines learning about selected methods of qualitative inquiry (participant-observation, in-depth interview, oral history) and analysis (grounded theory, ethnography, and discourse analysis). Enrollment by students from outside the Division of Social Science by instructor permission. Background: Knowledge in Social Science Prerequisite(s): SOSC 5110		
SOSC 5440	Economics of Development	3-0-0:3
This course covers the microeconomics of development, focusing on empirical applications. Topics include household models, human resource issues (health and education), intrahousehold economics, rural institutions in land, labor, and credit markets, technology adoption, risk-coping strategies, and evaluation of development projects. Lectures will concentrate on theoretical models and rigorous application of empirical methods, discussing important journal articles. Background: ECON 5110 OR ECON 5130, ECON 5280 OR ECON 5300 OR SOSC 5090		
SOSC 5500	Computational Social Science	3-1-0:3
The increasing use of the Internet and online communities in the last decade has led to an explosion of social data capturing every aspect of our daily activities. The new digital data have in turn led to the rise of Computational Social Science, an emerging field that aims to empirically study social behavior by applying computational methods, algorithms, and models on "big data". This course introduces the methods and ideas of computational social sciences. The course consists of lectures, projects and tutorials. Students will learn and evaluate the new possibilities and challenges that digital data have created for studying social phenomena. Students will also learn and practice essential methods that are needed to analyze digital data, from data collection to techniques and methods to analyze big data. Background: Knowledge of at least one programming language, such as Python or R. Prerequisite(s): SOSC 5090		
SOSC 6030P	Political Culture	3-0-0:3
This is a graduate-level seminar that offers an overview of theoretical and empirical approaches to the study of political culture. The study of culture is highly interdisciplinary, and this course surveys insights from fields such as political science, economics, public policy, psychology, evolutionary biology and anthropology. We will define the term culture using the tools of social science and discuss questions		

including where culture comes from, how culture is transmitted, and how culture changes. We then examine the possible implications of culture in areas such as economic growth, public goods provision, ethnicity, and social movement. Throughout the course, will read analyses drawn from many parts of the world, particularly Asia, Africa, North America, and Europe.		
SOSC 6880	Seminar on Emotion	3-0-0:3
This course covers major perspectives on emotion, with an emphasis on a psychological rather than a biological or a sociological level of analysis. It provides an in-depth examination of emotion theories and research to students with different research foci. Background: This is a graduate level course designed for advanced and motivated students with background in (a) upper-level (non-1000 level) psychology courses and (b) research methods in psychological science.		

[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.