# Course list for Cross-institutional Course/Subject Enrolment Scheme for Research Postgraduate Students
## (2024-25, Term 1)
## Institution: The Chinese University of Hong Kong

| Course Code | Course Title | Units | Keyword Syllabus or Brief Subject Description | Pre-requisites (if any) | Result Grade | Medium of Instruction | Remarks, if any |
|---|---|---|---|---|---|---|---|
| AIST5020 | Trustworthy Artificial Intelligence | 3 | This course introduces the principles and techniques of Trustworthy Artificial Intelligence (Trustworthy AI), which aims to mitigate the potential adverse effects of AI on people and society. The course focuses on four main aspects of trustworthy AI: privacy & security, robustness, explainability, and fairness. It covers the state-of-the-art research progress in these areas, including federated learning and adversarial attacks. Algorithms, models, and systems will be covered. Moreover, the course discusses the ethical and social implications of trustworthy AI, to foster social awareness among students who would use or develop AI techniques in the future. This course is suitable for students who have some background in machine learning, probability, and linear algebra. | - | A-F | English | - |
| ANTH6010 | Seminars in Anthropological Theory | 3 | The course provides an advanced review of major theoretical approaches in anthropology, from classic theories of Morgan, Tyler, Weber, and Durkheim, through the influential theories of Boas, Radcliffe-Brown, Levi-Strauss, Geertz and Douglas, to more recent theories. | - | A-F | English | Subject to teacher's approval on individual application. |
| ARTS6002 | Advanced Studies in the Humanities: Personal Identity | 3 | The lecture focusses on two main topics, which are intended to shed light on each other with regard to their prerequisites and conditions: On the one hand, the intrinsic structures of historical and systematic approaches to discourse will be presented and discussed with regard to their respective forms of thought; on the other hand, this will be approached with a view to non-European concepts of philosophy. It is therefore not a question of comparing so-called European-Western and non-European thought, which would be too simple anyway and would also encourage certain stereotypes such as "East and West" or "West versus East". Nevertheless, the focus of the lecture will be on the intercultural relevance of philosophical forms of thought, even if these may have been decidedly Western or Eastern at the time of their emergence. Only in the course of the globally active history of thought did it become increasingly clear that and how we owe it to each other to recognise and acknowledge the respective other sides, also in order to prevent our own hegemonic ambitions. | - | A-F | English | - |
| BASA6001 | Research Methodology in Behavioural Studies I | 3 | This course is divided into two main parts. The first part is focused on the application of the philosophy of science to behavioral research in business. Basic concepts such as explanation, scientific laws, and theory are introduced and discussed. The second part provides an introduction to the various stages of scientific research which include research design, measurement scale and development, sampling design, data collection and statistical analysis. Even though mathematical proofs and statistical derivations will be reduced to a minimum, having the knowledge of basic statistics and matrix manipulations will be helpful. | - | A-F | English | - |
| BASA6002 (offered by MKT) | Research Methodology in Behavioural Studies II | 3 | This course is the continuation of BASA6001. The course covers selected advanced topics associated with the behavioral research process. In particular, students will learn how to apply various types of research design and statistical methods, and how to interpret the results. Sample topics include among others experimental design, measurement theory, cross-cultural research, significance tests and statistical power, interaction and moderating effects, multi-level analysis, confirmatory factor analysis, and structural equation modeling. Even though mathematical proofs and statistical derivations will be reduced to a minimum, having the knowledge of basic statistics and matrix manipulations will be helpful. | BASA6001 or with instructor's permission. | A-F | English | Quota for visiting students: 3 |
| BMEG5610 | Research Methods in Biomedical Engineering | 3 | This course presents research methods in biomedical engineering, and primarily aims at preparing postgraduate students for basic research or employment in the clinic and biomedical industries. Students will learn relevant concepts and tools for analyzing data arising from quantitative and qualitative research in molecular, physiological, and clinical systems. This course focuses on developing students' ability to analyze research data and critique the scientific literature. | - | A-F | English | Quota for visiting students: 5 |
| CHLL6241 | Selected Works of the Philosophers (Zi) II | 3 | Critical study of works selected from pre-Qin philosophical writings. Topics focus on composition, transmission, authenticity, commentaries, and thoughts. Students are required to conduct research on a chosen topic under guidance. | - | A-F | Cantonese, Putonghua | - |
| CHLL6331 | Special Topics in Classical Chinese Poetry I | 3 | Critical study of classical Chinese poetry, with emphasis on particular authors, works or schools. | - | A-F | Cantonese, Putonghua | - |
| COMM5220 | Communication Theories I | 3 | This course provides an overview of the current theories and concepts in media, technology, human, and global communication studies. It serves as an introduction to the current literature, main epistemologies, key theories, representative scholars and their works, and key sources of reference. | - | A-F | English | Quota for visiting students: 2 |
| COMM5310 | Statistical Analysis in Communication | 3 | This course aims at introducing graduate students to the study of the scientific discipline of communication. The course covers analyses of data using the general linear model. Topics include simple and multiple regression, analysis of variance and covariance, tests of significance, the interpretation of model parameters and other topics like path analysis and structural equation modeling as time allows. Students are expected to conduct a complete quantitative research and analysis at the end of the course. | - | A-F | English | Quota for visiting students: 2 |
| CSCI5120 | Advanced Topics in Database Systems | 3 | This course will introduce to students advanced topics in database systems including advanced data structures, concurrency control, deadlock resolutions, recovery schemes, distributed database systems, multimedia database indexing techniques, and data mining, data on the web and network data analysis. | - | A-F | English | - |
| CSCI5150 | Machine Learning Algorithms and Applications | 3 | This course introduces a dozen of machine learning algorithms and typical applications in business intelligence, natural language processing, computer vision, and sensor-based data analyses, including four topics that consist of (1) supervised learning algorithms induced by structural risk minimization for classification and regression problems (decision trees, logistic regression, support vector machines, regularized linear regression, kernel machines, etc.), and their applications in sensor-based indoor localization, business intelligence; (2) supervised learning algorithms based on deep learning (CNN, RNN, etc.), and their applications to natural language processing and computer vision; (3) unsupervised learning algorithms for clustering and representation learning (K-means, spectral clustering, autoencoder, etc.); (4) introductions of other learning algorithms and applications, such as transfer learning, recommender systems, sensor-based activity recognition, etc. | - | A-F | English | - |
| CSCI5600 | Advanced Topics in Distributed Systems | 3 | This course aims to cover research topics on distributed systems. Topics including distributed time and global states, distributed coordination and consensus, P2P systems, distributed transactions and concurrency control, distributed replications and synchronization. Case studies about latest distributed systems such as Chord, Paxos and Spanner and research papers from top conferences will be discussed. Advisory: Students are expected to have solid foundations on operating systems and database systems. | - | A-F | English | - |
| CULS6100 | The Sexual Body in Arts and Media | 3 | The course in visual culture studies and gender studies will provide an overview of different modes of visualization, media paradigms, and bodily aesthetics that define contemporary sexuality. We will focus on theories of culture and art, new media, the body, ecofeminism, sexuality, and more. Students will be encouraged to engage with theories, audiovisual examples, and digital cultures, and participate in extensive debates about topics in sexuality and media. They will also learn how to apply innovative and interdisciplinary research methods to study media formats and regimes. | - | A-F | English | - |

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| DOTE5001 | Microeconomic Theory | 3 | This course is on advanced microeconomic theory. Topics include individual decision theory (consumer theory, production theory, choice under uncertainty), game theory (static and dynamic games under complete and incomplete information), and equilibrium and market failure (general equilibrium, principal-agent problems, economics of information, auctions, bargaining, and market design). | - | A-F | English | - |
| DOTE6632 | Research Sem in Operations & SCM | 3 | This seminar is designed to provide students with the latest knowledge on research issues, theories and methodologies in the areas of Operations and Supply Chain Management. Students will be required to read research papers, critique and synthesize other people's research work, and identify areas for future research. They are also required to present and discuss other people's research and their own research proposals. The instructor and scholars from different universities will also be invited to present their latest research. Topical areas will include Operations Supply Chain Strategy, Total Quality Management, Service Operations Management, Innovation and New Product Development, Lean Thinking, Business Process Improvement/Innovation, Relationship Management and Supply Chain Integration, Supply Chain/Logistics Network Design and other topics. | - | A-F | English | - |
| EASC5001 | Research Frontiers in Earth & Atmospheric Sciences I | 3 | This course introduces fundamentals in atmospheric and climate sciences at the graduate level, covering topics such as basic atmospheric physics and chemistry, general circulation, atmosphere-ecosystem interaction, climate change. There will be student presentations and discussions about recent research works, experimental and computational techniques in these areas. | - | A-F | English | Subject to teacher's approval on individual application. |
| EASC5120 | Petrology | 3 | Petrology is an essential subfield of Earth System Science because the rock record is the foundation for interpreting Earth history and internal processes. Petrologic concepts help us understand the Earth system, with connections to related fields such as geochemistry, geophysics, mineralogy, structural geology and geodynamics. This course broadly surveys the formation, distribution, chemical composition, mineral associations, and internal texture and structures in rocks of the earth's crust and upper mantle, and establishes it relation to global tectonic environments. Class lectures are supplemented by lab exercise, demonstrations and tutorials (e.g. study of rock hand specimens, understand phase rule, use of optical microscope etc.). | - | A-F | English | Subject to teacher's approval on individual application. |
| EASC5130 | Geomorphology | 3 | This course is an important part of the core Earth System Sciences Curriculum. It introduces the main concepts in geomorphology with emphasis on understanding the coupling of environments, processes and materials that leads to landform development. Understanding the underlying geological principles of rocks, minerals, structural deformation and geological time are important background knowledge to be enhanced by the study of geomorphology. It discusses the qualitative and quantitative techniques for investigation and research in the field, laboratory, and computer modeling. The application of geomorphology for public safety, engineering problems and development of sustainable solutions will be emphasized. Examples from theory and practice of geomorphology in Hong Kong will be introduced. Practical understanding and skills will be gained from lab exercises and field trips in Hong Kong. Students are suggested to be equipped with basic knowledge of rocks and minerals, structural geology and geological time scale. | - | A-F | English | Subject to teacher's approval on individual application. |
| EASC5170 | Geodynamics | 3 | What is the mechanism of plate tectonics and a variety of geological phenomena, such as seafloor spreading, mountain building, volcanoes, earthquakes, faulting? Geodynamics is going to answer those questions through observations and models of the large-scale behaviors of the solid Earth. The goal of the course is to develop a thorough understanding of physical processes, such as lithospheric deformation, heat transfer, and mantle flow. Lectures, paper discussions, and tutorials will help you to understand the principle of geodynamics, learn how to develop simple but useful models, and explain how the Earth evolves. | - | A-F | English | Subject to teacher's approval on individual application. |
| EASC5210 | Land-Atmosphere Interactions and Boundary-Layer Meteorology | 3 | This course introduces the physical, chemical and biological processes governing the exchange of energy, momentum, water and other chemical materials between the atmosphere and land surface, including a formal introduction into boundary-layer meteorology. Topics covered include the basic equations and concepts of heat, momentum and mass conservation and transfer at the land-atmosphere interface; soil physics and hydrometeorology; temperature, humidity and wind distribution in the atmospheric boundary layer; theories and observations of turbulence; stability and boundary-layer dynamics; biometeorology and ecophysiology of land plants; canopy and ecosystem exchange; and land use change and urbanization. Applications to weather phenomena, air pollution, forestry, agriculture and ecosystem management will be emphasized throughout. | - | A-F | English | Subject to teacher's approval on individual application. |
| EASC5240 | Air Pollution Science and Engineering | 3 | This course will cover a variety of topics related to air pollution science and engineering. Topics include: indoor and outdoor air quality (including particulate matters (PM) and gases pollutants); air pollution measurement and statistics; air quality meteorology and dispersion models; principles and challenges of air pollution control and measurement. | - | A-F | English | Subject to teacher's approval on individual application. |
| EASC5260 | Urban Climatology | 3 | Human modifications to the surface of the Earth during urbanisation change most of the elements of climate and weather in the urban atmosphere. This course introduces the fundamentals of urban climatology and the processes caused by the changes in the surface environment, particularly focusing on how urban structures interact with the atmospheric environment. Numerical modelling and field techniques are introduced to understand the underlying processes resulting urban climatic phenomena. It also examines the implications on human comfort and climate-sensitive urban planning and design, as well as the relationship between cities and climate change. | - | A-F | English | Subject to teacher's approval on individual application. |
| EASC5270 | Cloud Dynamics | 3 | This course presents an introduction to clouds. We begin with a descriptive cloud classification to introduce the different types of clouds in the Earth's atmosphere. This is followed by cloud microphysics, describing some of the basic microphysical processes regarding formation, growth, shrinkage, breakup and fallout of cloud and precipitation particles. This is then linked to cloud dynamics, associated with the fluid motions of the atmosphere. | - | A-F | English | Subject to teacher's approval on individual application. |
| ELEG5421 | Audio Signal Processing | 3 | This course is an in-depth exploration of audio processing using neural networks. Starting with an introduction to audio problems, the course covers a range of topics including audio features and human labels, filtering and digital signal processing for audio processing, audio and music tagging with convolutional neural networks, audio and music transcription with recurrent neural networks, audio compression, bridging audio and language with sequence-to-sequence models, symbolic music generation, audio and music generation with pipelines, vocoder, and autoregressive models, audio and music generation with VAEs and diffusion models, controllable audio and music generation from texts and multiple modalities, and open problems and future directions in the field. | Students should have knowledge of Linear Algebra, Probability, C/C++/Python, pattern recognition or machine learning. | A-F | English | Quota for visiting students: 5 |

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| ELEG5781 | Matrix Analysis and Computations | 3 | Matrix analysis and computations are widely used in engineering fields—such as machine learning, computer vision, systems and control, signal and image processing, optimization, communications and networks, and many more—and are considered key fundamental tools. This course covers matrix analysis and computations at an advanced or research level. It consists of several parts. The first part focuses on various matrix factorizations, such as eigendecomposition, singular value decomposition, Schur decomposition, QZ decomposition and nonnegative factorization. The second part considers important matrix operations and solutions such as matrix inversion lemmas, linear system of equations, least squares, subspace projections, Kronecker product, Hadamard product and the vectorization operator. Sensitivity and computational aspects are also studied. The third part explores presently frontier or further advanced topics, such as matrix calculus and its various applications, tensor decomposition, and compressive sensing (or managing undetermined systems of equations via sparsity). In every part, relevance to engineering is emphasized and applications are showcased. | - | A-F | English | Quota for visiting students: 5 |
| ENGG5105 | Computer and Network Security | 3 | This course aims to introduce important topics in computer and network security from an applied perspective. Topics include: (i) applied cryptography (e.g., cryptographic primitives, programming with OpenSSL), (ii) network security (e.g., unauthorized accesses, large-scale network attacks, firewall & intrusion detection systems), (iii) web security (e.g., HTTP session management and web attacks), and (iv) system security (e.g., buffer overflow, passwords, file system security). The course also discusses latest applied security topics depending on the current research trends. Advisory: Students are expected to have taken CSCI3150 or ESTR3102, and CSCI4430 or CENG4430 or IERG3310. | | A-F | English | - |
| ENGG5291 | Fiber Optics: Principles and Technologies | 3 | This course is an overview of fiber communication technology. This course content covers fiber transmission impairments, introduction to nonlinear optics, second order and third order nonlinear phenomena, lightwave propagation in nonlinear media, optical signal processing in communications and specialty fibers. | - | A-F | English | Quota for visiting students: 5 |
| ENGG5301 | Information Theory | 3 | Introduction. Shannon's information measures. Entropy rate of a stationary process. The source coding theorem. Kraft inequality. Huffman code. Redundancy of a prefix code. The channel coding theorem. Rate-distortion theory. Universal data compression. | - | A-F | English | - |
| ENGG5501 | Foundations of Optimization | 3 | In this course we will develop the basic machinery for formulating and analyzing various optimization problems. Topics include convex analysis, linear and conic linear programming, nonlinear programming, optimality conditions, Lagrangian duality theory, and basics of optimization algorithms. Applications from different fields, such as combinatorial optimization, communications, computational economics and finance, machine learning, and signal and image processing, will be used to complement the theoretical developments. No prior optimization background | - | A-F | English | - |
| GDRS5011 | Introduction to Gender Studies | 3 | This course introduces students to the main streams of the current academic discourse on gender theory and feminism. It will explore various schools of thought in feminism and relate theoretical frameworks to issues of current interest such as the ability of women to earn an independent income, social security, occupational segregation, women sexuality, body politics and discrimination against women in different fields of society. It also introduces students to some basic methodology in gender and feminist research. | - | A-F | English | Quota for visiting students: 5 |
| GDRS5087 | Feminist Methodology | 3 | The purpose of this course is to acquaint students with the intellectual debate between feminist epistemology and scientific knowledge production as well as to equip them with the abilities of critical thinking about their methodologies and conducting research with proper methods. Topics include: 1) critically questioning the validity of knowledge production, the power relations between the researcher and his or her research subjects, and the representation of the research and the researcher; 2) cautiously examining the influence of globalization on feminist research and the intersectionality among race, class and gender; and 3) innovatively connecting theory with praxis through participatory action and writing. We will begin with a brief introduction to the history and development of feminist research, followed by discussions on feminist methodologies by exemplary researchers. In the final weeks, we will shift our focus to the application of theory and groundbreaking feminist writing through collaboration. | - | A-F | English | Quota for visiting students: 5 |
| GPAD5050 | Qualitative Methods of Political Research | 3 | Conceptual foundation of research in social science, design and structure of political research, and methods for collecting and analyzing qualitative data. | - | A-F | English | - |
| GPAD5055 | Quantitative Methods of Political Research | 3 | Principles of data collection and analysis and a variety of statistical models. | | A-F | English | - |
| GRMD5110 | Statistical Applications in Geography | 3 | This course is an introduction to statistical methods in geographic research. The goal of this course is to provide a practical understanding of the application of statistical analysis to geographic problem solving. Emphasis is placed on the application of appropriate methods to analyse geographic data, the appropriate procedures for research design, and the interpretation of research results. Topics include: geographical data and data manipulation, spatial autocorrelation, multiple linear regression, logistic regression, principal components analysis, factor analysis, cluster analysis and discriminant analysis. | Basic Statistics | A-F | English | Quota for visiting students: 5 |
| HIST6010 | Graduate Seminar on Historiography | 3 | This is a mandatory course designed for the first year research postgraduate students of the History Department. The goal is to prepare the students with a wide-range knowledge of modern historiography. | - | A-F | English, Putonghua | Quota for visiting students: 1 |
| HIST6016KW | Selected Themes in Comparative History: Japanese-Chinese Translation for Historical Research | 3 | This course enables students to acquire thorough understanding of the Japanese grammar including morphology and syntax up to advanced level, sentence patterns as well as important Japanese reference tools, which are instrumental in reading different kinds of historical works in Japanese. By reading and translating the classic works of the Japanese scholars, students will also be able to master advanced Japanese grammar, Japanese-Chinese translation skills and the Japanese vocabulary and concepts pertaining to their historical research, and comprehend and review the important views of the Japanese scholars in their research fields. Seminars are conducted to discuss and translate the Japanese historical works related to students' research. | - | A-F | English, Putonghua, Japanese | Quota for visiting students: 2 |
| HIST7010 | Graduate Seminar on Historiography | 3 | This is a mandatory course designed for the first year research postgraduate students of the History Department. The goal is to prepare the students with a wide-range knowledge of modern historiography. | - | A-F | English, Putonghua | Quota for visiting students: 1 |
| HIST7016KW | Selected Themes in Comparative History: Japanese-Chinese Translation for Historical Research | 3 | This course enables students to acquire thorough understanding of the Japanese grammar including morphology and syntax up to advanced level, sentence patterns as well as important Japanese reference tools, which are instrumental in reading different kinds of historical works in Japanese. By reading and translating the classic works of the Japanese scholars, students will also be able to master advanced Japanese grammar, Japanese-Chinese translation skills and the Japanese vocabulary and concepts pertaining to their historical research, and comprehend and review the important views of the Japanese scholars in their research fields. Seminars are conducted to discuss and translate the Japanese historical works related to students' research. | - | A-F | Putonghua, Japanese | Quota for visiting students: 2 |

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| IERG5110 | Signal Processing in Wireless Communications and Sensing | 3 | The course aims to provide students a hands-on learning experience on signal processing algorithms in real-world wireless communication and wireless sensing systems. To this end, the course will use some standard wireless LAN technologies as an example to teach students the principles, implementations, and evaluations of various signal processing algorithms for realizing wireless communications and wireless sensing. For the communication part, all the building blocks of transmitting and receiving wireless LAN signals will be covered. For the sensing part, advanced algorithms to process wireless LAN channel state information (CSI) data for enabling various sensing applications (e.g., human activity recognition, object sensing, device identification, and localization) will be discussed. Matlab or Python will be used to implement and evaluate the signal processing algorithms involved in this course. Topics will include: 1. Introduction to wireless communication systems and wireless LAN systems 2. Wireless multipath channels and intersymbol interference 3. Orthogonal frequency-division multiplexing (OFDM) modulation and demodulation 4. Packet detection, frequency and time synchronization, and channel estimation and equalization in OFDM systems 5. MIMO-OFDM 6. Introduction to wireless sensing and its applications 7. Imperfections in OFDM systems and their implications on channel state information (CSI) 8. CSI data processing and feature extraction algorithms in common wireless sensing applications. | - | A-F | English | - |
| IERG5130 | Probabilistic Models and Inference Algorithms for Machine Learning | 3 | This course is a graduate level introduction to probabilistic models and inference algorithms, which constitute a common foundation for many methodologies in machine learning and related fields (e.g. computer vision, natural language processing, and data mining). The course begins with a detailed exposition of probabilistic graphical models, then proceeds with various inference methods, including variational inference, belief propagation, and Markov Chain Monte Carlo (MCMC). In the second part of the course, we then discuss the connections between probabilistic models and risk minimization, as well as how optimization-based methods can be used in large-scale model estimation. Finally, the course will briefly discuss nonparametric models, e.g. Gaussian processes, and their use in practical applications. | Advisory: Basic knowledge on linear algebra, probability theory, optimization are required. | A-F | English | - |
| IERG5250 | Edge AI and Applications | 3 | This course aims to introduce various key concepts, technologies and applications in edge artificial intelligence (AI), which is the implementation of AI applications in an edge computing environment, which allows the computation to be processed close to where the data is located. The topics covered include, but are not limited to: basic concepts and fundamental technologies in edge AI, hardware for edge AI (e.g., embedded AI accelerators, FPGA, and infrastructures), interaction between edge AI and the cloud, machine learning techniques for model compression, security and privacy in edge AI, applications of edge AI for smart health and autonomous driving. | - | A-F | English | - |
| IERG5310 | Security and Privacy in Cyber Systems | 3 | This course discusses the design and realization of security and privacy services in practical large-scale systems. Topics include: Online Identity and Authentication Management ; Safe Browsing ; Geolocation privacy ; Mobile payment systems with Smartcard/ Near Field Communications (NFC) ; e-cash ; Best privacy practices for Online Social Networks and Mobile applications ; Cloud Computing security and privacy: Trustworthy Cloud Infrastructure; Secure Outsourcing of Data and Computation ; Data Provenance; Virtual Machine security. Additional cyber security services/applications such as e-voting systems, secure and anonymous routing systems, digital rights management will also be covered. | Advisory: Students are expected to have basic background in Cyber Security. | A-F | English | - |
| IERG5320 | Quantum Information Processing | 3 | This course is an introduction to digital forensics and cyber crime investigation. It will discuss techniques, methods, procedures and tools for applying forensic science and practice to the acquisition and analysis of evidence existing in digital form for the purposes of cyber crime investigation. Specific topics include computer (hard disk, file-systems) forensics, network/intrusion forensics, mobile device forensics, and a brief introduction to multimedia forensics. Techniques for detecting, tracking, dissecting and analyzing malware and other malicious cyberspace activities will also be covered. | Advisory: Students are expected to have basic background in C/C++ programming skills. | A-F | English | - |
| IERG5380 | Quantum Information Processing | 3 | This course offers an introduction to quantum information processing. It covers the fundamental concepts including superposition, entanglement, state preparation, unitary and non-unitary evolution, and quantum measurements. Various quantum algorithms like quantum teleportation, superdense coding, the Deutsch-Jozsa algorithm, the Shor algorithm, and the Grover algorithm are further discussed. Quantum error-correction coding schemes based on the stabilizer formalism are introduced to enhance the reliability of these algorithms. Standard mathematical and diagrammatic tools are introduced for describing the relevant objects and processes. | Advisory note: Solid understanding of linear algebra is required. Pre-knowledge of quantum mechanics, graphical models, information theory, and coding theory is useful but is not required; relevant materials from these topics are introduced where required to make the course self-contained. | A-F | English | - |
| IERG5670 | Computational Imaging Systems and Algorithms | 3 | Computational imaging systems are novel cameras that are combinations of optics, sensors, electronics, and algorithms that jointly enable new approaches for smart visual sensing and perception. It has a wide variety of applications in consumer electronics, autonomous driving, robotics, remote sensing, medical imaging, human computer interaction, machine vision, and scientific imaging. This course will cover core ideas and advanced topics of computational imaging systems and algorithms, including camera and image sensor models, high dynamc range imaging, coded imaging systems (aperture, exposure, illumination), burst photography for low-light imaging, 3D imaging, plenoptic functions and light field, Neural Radiance Fields (NeRF), compressive sensing, neuromorphic imaging, optical neural network, and more. Emphasis is on novel hardware and system design of computational cameras, as well as solving inverse problems with classic optimization algorithms and modern end-to-end learning-based methods. Students will learn the core principles of many computational imaging systems and implement key optimization-based and learning-based algorithms to solve inverse problems. | Advisory note: It is preferred to have taken courses in deep learning and signal processing beforehand. | A-F | English | - |
| IERG6120 | Advanced Topics in IE I (Convex & Stochastic Optimization and Applications) | 3 | We will study two extremely powerful optimization tools that are broadly applicable to many IE/EE/CSE problems: • Convex optimization: Lagrange duality, primal and dual decomposition, distributed/asynchronous algorithms, proximal optimizations, stochastic approximation. • Stochastic optimization under uncertainty: Markov decision program, dynamic programming. • Special attention to the needs in large and decentralized settings Application-driven learning: Examples will be drawn from wireless communications, networked systems, and machine learning to illustrate each topic. | - | A-F | English | - |

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| IERG6200 | Advanced Topics in Computer Networks (Advanced Topics in Embedded AI) | 3 | This is a systems course that will enable students to have in-depth understanding of key AI algorithms and their implementation for embedded and Internet of Things (IoT) systems. The topics cover 1) overview of basic signal processing algorithms such as FFT and digital filters; 2) advanced AI algorithms such as acoustic and visual signal processing, spatial sensing, machine learning etc.; 3) their implementation on cutting-edge IoT platforms and key system issues such as energy efficiency and real-time in the contexts of a set of representative IoT applications such as smart health, environmental monitoring, smart homes/buildings, smart cities etc. Students will work on an individual or team project to build an end-to-end system. The project should have a significant AI algorithm components and include implementation on real embedded IoT platforms. In addition to course project assignments, students will also read and discuss latest publications in the areas of embedded AI, Internet of Things, Cyber-Physical Systems, mobile systems, and ubiquitous computing. | - | A-F | English | - |
| MKTG6152 | Advanced Seminar in Marketing - Behavioral Studies I | 3 | This course aims to deepen graduate students' understanding of recent research in key areas of consumer behavior. Topics will vary over course offerings but may include AI and technology, luxury consumption, and sustainability. | - | A-F | English | Quota for visiting students: 6 |
| PHYS5330 | Instrumentation I | 3 | This course provides an introduction to the working principles and operation techniques of instruments commonly used in experimental physics. Topics covered include: transducers and sensors; signal conditioning, propagation and conversion; noise, signal recovery techniques, computer interface, vacuum techniques, and integrated-circuit instrumentation. This course also includes laboratory experiments for practice and illustration of the subject matter. | - | A-F | English | Quota for visiting students: 3 |
| PHYS5410 | Advanced Quantum Mechanics | 3 | This course will discuss various theoretical topics of non-relativistic quantum mechanics at the graduate level. The quantum mechanics of many-body systems will also be introduced. Topics covered include: operator methods in quantum mechanics, addition of angular momenta, variational method, stationary perturbation theory, time-dependent perturbation theory, scattering theory, and introduction to the quantum theory of many-body systems. | - | A-F | English | - |
| PHYS5550 | Topics in Theoretical Physics (Quantum Optics) | 3 | Concept of photons, properties and applications of nonclassical light, photo-detection of optical coherence, photon-atom interaction models, quantum theory of damping, laser theory, atom coherence effects, and an introduction to quantum communication. | - | A-F | English | Quota for visiting students: 3 |
| SEEM5010 | Advanced Database and Information Systems | 3 | Database and information system design and control: advanced data structures, query optimization, recovery, concurrency control, deadlock resolution and recovery. Distributed system environment. Object-oriented approach. Engineering application: requirements and proposed solutions. Current Topics. | - | A-F | English | - |
| SEEM5160 | Advanced Data Science for Systems Engineering | 3 | This graduate level course introduces the basic concepts of statistical pattern processing and machine learning algorithms. | - | A-F | English | - |
| SEEM5340 | Stochastic Calculus | 3 | Introduction to continuous time stochastic processes. Brownian motions: explicit constructions, properties, quadratic variation, the Cameron-Martin-Girsanov formula, multidimensional Brownian motions. Stochastic Integration: definition, Ito's formula, martingale representation, time change, Girsanov's Theorem, local time and Tanaka's formula. Stochastic differential equations and diffusion processes: strong and weak solutions, diffusions, the Feynman-Kac formula, backward stochastic differential equations. Levy processes: definition, the Levy-Khinchin representation, the Levy-Ito decomposition, the Esscher transform. | - | A-F | English | - |
| SEEM5580 | Advanced Stochastic Models | 3 | Poisson process. Birth-and-death process, Markov chain. Martingale. Brownian motion. Renewal and stationary processes. Stochastic integration and Ito's formula. Applications to queueing models, inventory models, and financial investment/hedging models. | - | A-F | English | - |
| SOCI6001 | Advanced Theory | 3 | This course is primarily intended to give graduate students a detailed introduction to some foundational theoretical questions and positions in sociology. It is centered on the writings of Max Weber, Emile Durkheim, and Karl Marx, supplemented by other (and more recent) theoretical work. The readings and seminar discussions will cover three mains sets of issues: 1) the relationship between the individual and society; 2) the special challenges and problems confronting a science of society; and 3) theoretical accounts of key modern social structures. Secondarily, students will through a series of exercises leading up to a final paper gain practice in the essential skill of "reading and writing with theories." The course grade will be based on a term paper, which will be assigned a letter grade according to following rubric: The "significant progress" mentioned in the rubric will be judged in reference to the writing exercises completed during the second half of the course but which will not be graded separately. | - | A-F | English | - |
| SOCI6002 | Advanced Methodology | 3 | This is an intensive training course on the logic of theory construction and the logic of evidence building in empirical sociology. The theoretical and evidential logics provide the foundation for the effective use of qualitative and quantitative data analysis alike. The course will provide the tools for clarifying the theoretical and evidential logics of an empirical study and introduce three families of explanatory mechanisms that are relevant to diverse subfields of sociology. Most importantly, the course will develop the competence of students in theory construction and evidence building through learning-by-doing. Much of the course will be devoted to a re-examination of many exemplary works in empirical sociology from each theoretical family. The course will not focus on any philosophical debate or technique of data analysis. | - | A-F | English | - |
| STAT5005 | Advanced Probability Theory | 3 | Measure theory concepts needed for probability. Expectation, distributions. Laws of large numbers and central limit theorems for independent random variables. Characteristic function methods. Conditional expectations, martingales and martingale convergence theorems. (For students in MPhil-PhD Statistics) | A good understanding of basic probability. | A-F | English | Subject to teacher's approval on individual application. Quota for visiting students: 10 |

**Course list for Cross-institutional Course/Subject Enrolment Scheme for Research Postgraduate Students**
**(2024-25, Term 1)**
**Institution: The Chinese University of Hong Kong**

| Course Code | Course Title | Units | Keyword Syllabus or Brief Subject Description | Pre-requisites (if any) | Result Grade | Medium of Instruction | Remarks, if any |
|---|---|---|---|---|---|---|---|
| STAT5050 | Advanced Statistical Computing | 3 | This course covers the theory and application of advanced statistical computer algorithms for solving analytically intractable problems. Typical problems include root finding, numerical integration, optimization, model selection. Specific algorithms discussed may include Newton-Raphson, Monte Carlo integration, EM, importance sampling, Markov chain Monte Carlo algorithms, simulated annealing, and bootstrap. | Statistical Inference course for PhD students or permission of Instructor. | A-F | English | Subject to teacher's approval on individual application. Quota for visiting students: 10 |
| STAT5060 | Advanced Modeling and Data Analysis | 3 | This course covers recent developments in statistical modeling and data analysis. Topics may include generalized linear models (GLM), mixed effects models, hierarchical models, mixture models, generalized additive models, hidden Markov model, Bayesian network, and other advanced statistical models. Statistical analysis for different types of data, such as discrete data, non-normal continuous data, hierarchical/heterogeneous data, longitudinal data, and incomplete data, will be discussed. | Course for PhD students or permission of Instructor. | A-F | English | Subject to teacher's approval on individual application. Quota for visiting students: 10 |
| STAT6050 | Studies on Selected Topics III | 3 | Basic Theory for Generative AI: Diffusion Models and Reinforcement Learning Course Description: This course aims to introduce part of elements of generative AI, concentrating on diffusion models and reinforcement learning. Topics include DDPM/DDIM, offline/online learning, game theory and so on. We will mainly focus on understanding the computational and sample complexity. | Statistical Inference course for PhD students or permission of Instructor. | A-F | English | Subject to teacher's approval on individual application. Quota for visiting students: 10 |