

PROGRAMMES OF STUDY

Institute of Collaborative Innovation

Master’s Degree Programmes

Master of Science

- **Cognitive Neuroscience**

Compulsory Courses		Credits
CCBS7001	Principles of Neuroscience	3
CCBS7002	Cognitive Neuroscience	3
CCBS7003	Brain Stimulation and Neuroimaging Techniques	3
CCBS7098	Project Report	6
Total Credits:		15

Required Electives – Group 1 (Students are required to take 2 Required Electives from Group 1 to obtain 6 credits)		Credits
CCBS7004	Magnetic Resonance Imaging	3
CCBS7005	Computational Cognitive Neuroscience	3
CMED7018	Bio-Statistics	3
Total Credits:		6

Required Electives – Group 2 (Students are required to take 3 Required Electives from Group 2 to obtain 9 credits)		Credits
EDUC7402	Psychology of Learning	3
EDUC7503	Advanced Exercise Physiology	3
EDUC7403	Advanced Developmental Psychology	3
AHGC7400	Clinical Linguistics	3
ENGL7004	Psycholinguistics	3
AHGC7302	Second Language Acquisition	3
ENGL7005	Sociolinguistics	3
ECEN7021	Biomedical Transducers and Instruments	3
CISC7026	Introduction to Deep Learning	3
CISC7013	Principles of Artificial Intelligence	3
CISC7202	Tools for Machine Learning	3
PYSC7708	Behavioral Addiction	3
IRTM7036	Cross Cultural Gambling Psychology	3
CCBS7006	Neuroeconomics	3
Total Credits:		9

Grand Total:	30
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Master's Degree Programmes

Master of Science

- **Data Science**

Compulsory Courses		Credits
CISC7201	Introduction to Data Science Programming	3
CISC7204	Data Science and Data Visualization	3
CISC7203	Database and Data Mining Technologies	3
CISC7202	Tools for Machine Learning	3
Total Credits:		12

Specialization A -- Artificial Intelligence Applications:

Compulsory Courses		Credits
CISC7298	Project Report	6
Total Credits:		6

Required Elective	<i>(Choose 4 Required Electives from the following)</i>	Credits
CISC7013	Principles of Artificial Intelligence	3
CISC7018	Computer Vision and Pattern Recognition	3
CISC7019	Web Mining	3
CISC7021	Applied Natural Language Processing	3
CISC7022	Big Data Processing and Analysis	3
CISC7026	Introduction to Deep Learning	3
Total Credits:		12

Grand Total: **30**

Specialization B -- Marketing Analytics:

Compulsory Courses		Credits
MKTG7010	Marketing Management	3
MKTG7030	Consumer Behavior	3
MKTG7033	Marketing Analytics	3
BAGC7011	Research Methods	3
BAGC7891	Project Report	6
Total Credits:		18

Grand Total: **30**

Specialization C -- Financial Technology:

Compulsory Courses		
FINC7060	Topics in Data Analytics and Financial Technology	3
FINC7054	Introduction to Modern Financial Technology	3
BAGC7891	Project Report	6
Total Credits:		12
Required Elective		Credits
<i>(Choose 2 Required Electives from the following)</i>		
FINC7010	Corporate Finance	3
FINC7026	International Banking and Bank Management	3
FINC7035	Financial Risk Management	3
ACCT7060	Financial Statement Analysis for Decision Making	3
BECO7010	Statistics and Financial Econometrics	3
Total Credits:		6
Grand Total:		30

Specialization D -- Data Strategy and Compliance:

Compulsory Courses		Credits
LAWS7701	Data Applications and Regulation in Digital Society	3
LAWS7702	Big Data Analytics and Compliance in E-business	3
LAWS7703	Data Strategy and Protection in Healthcare and E-governance	3
LAWS7704	Artificial Intelligence and Comparative Law	3
LAWS7791	Project Report	6
Total Credits:		18
Grand Total:		30

Specialization E -- Precision Medicine:

Compulsory Courses		Credits
HSCI7001	Artificial Intelligence in Medicine	3
HSCI7002	Biomedical Sciences	3
HSCI7003	Digital Bio-medicine	3
HSCI7004	Healthcare Analytics	3
HSCI7998	Project Report	6
Total Credits:		18
Grand Total:		30

Specialization F -- Computational Linguistics:

Compulsory Courses		Credits
AHGC7315	Language and Linguistics	3
AHGC7398	Project Report	6
Total Credits:		9
Required Elective		Credits
<i>(Choose 3 Required Electives from the following)</i>		
CISC7021	Applied Natural Language Processing	3
ENGL7022	Corpus Linguistics	3

AHGC7039	Computer-aided Translation	3
AHGC7303	Evaluation and Assessment of Language Use	3
CHLL7101	Methods in Chinese Linguistics	3
AHGC7308	Special Topics in Applied Linguistics I	3
PHIL7101	Topics in Semantics	3
Total Credits:		9

Grand Total: 30

Specialization G -- Analytics in Teaching and Learning:

Compulsory Courses

EDUC7098	Project Report	6
Total Credits:		6

Required Elective	(Choose 4 Required Electives from the following)	Credits
EDUC7041	Assessment and Evaluation of Educational Big Data	3
EDUC7042	Data-driven Approach to Educational Administration	3
EDUC7043	Learning Enhancement with Big Data	3
EDUC7044	Quantitative Social Science Research with Big Data	3
SSGC7201	Civic Data Acquisition and Analysis	3
Total Credits:		12

Grand Total: 30

Specialization H -- Smart Governance:

Compulsory Courses

SSGC7298	Project Report	6
Total Credits:		6

Required Elective	(Choose 4 Required Electives from the following)	Credits
SSGC7201	Civic Data Acquisition and Analysis	3
SSGC7202	Big Data and Smart Governance	3
SSGC7203	Analysis of Media and Opinion Data	3
SSGC7204	Making Sense of Smart Governance	3
EDUC7044	Quantitative Social Science Research with Big Data	3
Total Credits:		12

Grand Total: 30

Course Description

Master of Science - Data Science

CISC7201 INTRODUCTION TO DATA SCIENCE PROGRAMMING

This course covers both the fundamental and advanced topics in Natural Language Processing (NLP), which deals with the application of computational models to text data. In this course, the core tasks in natural language processing will be examined, including minimum edit distance, language modelling, N ave Bayes, Maximum Entropy, text classification, sequence labelling, POS tagging, syntax parsing and computational lexical semantics. Modern NLP applications will be explored such as information retrieval, and statistical machine translation. Students will learn how to formulate and investigate research questions on related topics.

Pre-requisite: None

CISC7204 DATA SCIENCE AND DATA VISUALIZATION

This course is designed to enable students to learn the significance of data visualization in data science and big data analytics, and develop knowledge and skills to present quantitative data using data visualization tools. This course emphasizes on the practical aspects of data science with a focus on using R or Python programming language to process data, produce visualizations, and interpret these visualizations. Students will learn the practice of data cleaning, reshaping of data, basic tabulations, aggregations and visual representation in order to increase the understanding of complex data and models.

Pre-requisite: None

CISC7203 DATABASE AND DATA MINING TECHNOLOGIES

This course is designed to enable students to learn the database and data mining concepts and techniques for big data analytics and development in different domains. The course concentrates on the practical issues of database and data mining for solving big data problems. The content includes data modeling in database and data warehouse, SQL, Python programming for database, Python programming and R programming for data mining applications. Students will learn the skills of database modeling, querying, and programming, as well as the programming techniques for data mining.

Pre-requisite: None

CISC7202 TOOLS FOR MACHINE LEARNING

This course introduces Machine Learning (ML) basics, methods, and algorithms, with a significant amount of hands-on practice using modern software tools (e.g., Scikit-learn and PyTorch). After the first introductory lecture on machine learning, the course covers four key topics of ML: 1) regression techniques including linear regression, ridge and lasso regression, nearest neighbor and kernel regression; 2) classification techniques including logistic regression decision trees, boosting and bagging, SVM and N ave Bayes; 3) clustering techniques including k-means, hierarchical clustering, DBScan, and mixture models; and 4) deep learning techniques including neural network basics, convolutional neural networks, and generative neural networks.

Pre-requisite: Introduction to Data Science Programming

Specialization A: Artificial Intelligence Applications

CISC7013 PRINCIPLES OF ARTIFICIAL INTELLIGENCE

Overview of Traditional Artificial Intelligence Principles: Problem Solving, and Logical Agent. Overview of Modern Artificial Intelligence Principles: Machine Learning, Decision Tree, Neural Networks, Support Vector Machines, and Introduction to Deep Learning.

Pre-requisite: None

CISC7018 COMPUTER VISION AND PATTERN RECOGNITION

This course introduces the fundamentals and advanced topics of computer vision and pattern recognition for postgraduate students. It emphasizes both theory and applications of computer vision and pattern recognition. Topics include Bayesian decision theory, support vector machine, image features, image stitching, component analysis, neural networks and deep learning.

Pre-requisite: None

CISC7019 WEB MINING

The course will cover the fundamental concepts, principles and algorithms in the area of Web Mining. It will firstly give an introduction to the concepts of the traditional information retrieval systems and the principles of web search engines, then, the course will extensively discuss techniques and algorithms of web mining, including Link-Base analysis, web page classifications, web advertisement, recommendation algorithms, web information extractions, web image indexing. The course also requires each student to complete a related course project.

Pre-requisite: None

CISC7021 APPLIED NATURAL LANGUAGE PROCESSING

This course covers both the fundamental and advanced topics in Natural Language Processing (NLP), which deals with the application of computational models to text data. In this course, the core tasks in natural language processing will be examined, including minimum edit distance, language modelling, N vie Bayes, Maximum Entropy, text classification, sequence labelling, POS tagging, syntax parsing and computational lexical semantics. Modern NLP applications will be explored such as information retrieval, and statistical machine translation. Students will learn how to formulate and investigate research questions on related topics.

Pre-requisite: None

CISC7022 BIG DATA PROCESSING AND ANALYSIS

This course introduces the latest development of data engineering techniques, including data query processing (e.g., multi-dimensional data, sequence data, and spatial-temporal data) in cloud computing and HPC environments. Students will learn study and learn how to formulate and investigate the state-of-the-art problems and solutions on related topics.

Pre-requisite: None

CISC7026 INTRODUCTION TO DEEP LEARNING

This course introduces Deep Learning (DL) basics, methods, and algorithms, with hands-on practice using modern DL library tools (e.g., PyTorch). After the introductory lecture on deep learning, the course first covers the fundamental of neural networks, including universal approximator theory, learning neural networks, backpropagation, optimization, stochastic gradient descent, and tricks on training neural networks, and then focuses on typical neural network architectures, including Convolutional Neural Networks, Recurrent Neural Networks, and Generative Neural Networks.

Pre-requisite: None

CISC7298 PROJECT REPORT

Project Report focuses on combining existing academic theories or advanced technologies with an evaluation of a case study or academic project. Students will learn systematic problem-solving process skills, professional research and development practices, and project management skills. The goal of this option is to facilitate the integration of practice with academic research.

Pre-requisite: None

Specialization B: Marketing Analytics

MKTG7010 MARKETING MANAGEMENT

This course seeks to equip students with the key conceptual, analytical and problem solving skills to address marketing problems and decisions. Specifically, it introduces students to various

marketing analyses (customer, competitor and company analysis) and marketing strategies. Tools and methods used in planning and implementing the four Ps (product, price, place and promotion) will be explored. This course integrates theory and practice within the context of organizations operating locally and globally.

Pre-requisite: None

MKTG7030 CONSUMER BEHAVIOR

The purpose of this course is to study the process of consumer decision-making and its determinants, and the resulting implications for marketing strategy. Concepts and theories covered in this course are essential for consumer analysis and the development of effective marketing strategies. A strategic orientation will permeate most facets of this course. At the same time, knowledge of consumer behavior requires an understanding of important theoretical concepts borrowed from fields such as social psychology, consumer psychology, and experimental psychology.

Pre-requisite: MKTG 7010 Marketing Management

MKTG7033 MARKETING ANALYTICS

This course is designed to help students understand the development of marketing data in the big data era and the value of such data in marketing decision making. Students will be introduced the broad range of marketing data available to businesses, ways to gain insights from the data and convert insights into profitable customer acquisition, retention and growth efforts. Important marketing data usages (e.g., customer behavior prediction, customer value evaluation, social listening, etc.) are discussed using examples from different industries. Issues of data privacy and implementation challenges in big data marketing will also be explored.

Pre-requisite: MKTG 7010 Marketing Management

BAGC7011 RESEARCH METHODS

The course provides postgraduate business students with the fundamental analytical skills that they need for their project report, as well as a good understanding of the overall research process. The course guides students through every step of a research project, from getting started to analyzing data and writing a mock project report. It provides enhanced coverage of quantitative methods available for a variety of business topics, and contains demonstrations of the use of statistical software in a wide range of business research.

Prerequisite: None (for students of Master of Science in Data Science (Big Data and Analytics in Marketing))

BAGC7891 PROJECT REPORT

This Project Report gives the students an opportunity to apply the knowledge obtained from their previous studies in data science and their field of specialization. Students will be required to identify existing practical problems in their field of specialization. To develop solutions for the problems identified, they need to conduct detailed literature review, design appropriate research method, gather relevant data, analyze their data using big data analytic techniques, interpret their findings, and finally write up the entire project report.

Pre-requisite: Research Methods, Marketing Analytics [for students of MSc in Data Science (Big Data and Analytics in Marketing)] & FINC7010 Corporate Finance AND FINC7054 Introduction to Modern Financial Technology [for students of MSc in Data Science (Financial Technology)]

Specialization C: Financial Technology

FINC7010 CORPORATE FINANCE

This course offers students a more advanced understanding of important concepts in the field of corporate finance. It covers basic topics including capital budgeting, alternative valuation methods, capital structure decisions, corporate payout policy, securities offering decisions, as well as more advanced topics (optional) such as corporate governance, mergers and acquisitions, and

corporate risk management. The objective of this course is to provide students with essential tools to study more advanced courses in finance.

Pre-requisite: None (for Master of Science in Data Science (Financial Technology))

FINC7026 INTERNATIONAL BANKING AND BANK MANAGEMENT

This course is structured around the microeconomic problems of financial management of banking firms. It focuses on decision making and offers a unique approach to understanding commercial bank management. Topics to be covered include banking trends and competition, performance analysis, liquidity planning, interest rate risk management, credit risk analysis, cost of funds, and capital management. Both domestic and international banking activities will be examined. The objective of this course is to provide the student with the conceptual framework necessary to analyze and comprehend the current problems confronting managers of commercial.

Pre-requisite: FINC7010 Corporate Finance/FINC7011 Managerial Finance

FINC7035 FINANCIAL RISK MANAGEMENT

This course focuses on risk management techniques in multinational corporations and credit risk management. A strand of risk management topics would be covered such as foreign exchange, money market instruments, derivative products, risk exposure of corporations, measurement of exposure, and risk management in financial institutions. The credit risk will discuss various economic and financial factors that affect credit quality of corporations, evaluating corporation's debt servicing ability and their likelihood of default. Topics covered will include business and financial risk analysis, debt covenants, security structures, credit scoring and credit rating models.

Pre-requisite: FINC7010 Corporate Finance

FINC7054 INTRODUCTION TO MODERN FINANCIAL TECHNOLOGY

The financial industry is undergoing profound changes in the past several years. With the arrival of new technologies, financial services firms are increasingly using these new technologies to increase their efficiency, develop new businesses and services, and revolutionize their marketing practices. The lines between financial services and technology firms have also blurred, as we are seeing more and more technology companies venturing into the finance industry, particularly in China.

This course aims to provide you with an overview of FinTech and its implications within the finance industry and beyond. We will review companies in the FinTech industry, their businesses, products, and technologies. We will also cover the basic technologies that power the FinTech revolution, such as Artificial Intelligence (AI), Blockchain (B), Cloud Computing (C), and Big Data (D). We will also discuss FinTech's current status and future trends. After this course, you will have a basic understanding of the FinTech landscape and be ready to explore more about it.

Pre-requisite: FINC7010 Corporate Finance

FINC7060 TOPICS IN DATA ANALYTICS AND FINANCIAL TECHNOLOGY

This course introduces to students the advanced statistical and decision analysis tools. It emphasizes on the applications of data analytics techniques in business practices. Students will learn the intuition behind the methods and build hands-on experiences using Python, which is the most popular programming tool with versatile applications in finance and economics.

Pre-requisite: None

ACCT7060 FINANCIAL STATEMENT ANALYSIS FOR DECISION MAKING

This course aims to demonstrate how financial statements can be reformulated, analyzed and interpreted for decision making. It first identifies information sources that analysts frequently employ in financial statement analysis and examines the steps of the financial statement analysis framework. It then discusses the objective of financial reporting and how financial reporting standards affect security analysis and valuation. The course will cover important tools and techniques used in financial analysis including activity, liquidity, solvency, profitability and valuation ratios, describe the relationships among those ratios and evaluate real life companies using ratio analysis. It also demonstrates the application of DuPont analysis of return on equity, and other ratios especially used in equity analysis and credit analysis. Finally, it provides a

framework for considering potential analyst adjustments that are necessary when comparing companies that use different accounting methods or estimates.

Pre-requisite: None (for Master of Science in Data Science (Financial Technology))

BECO7010 STATISTICS AND FINANCIAL ECONOMETRICS

This course introduces the basic tools with the aid of data for decision making in finance. It covers introductory probability, decision analysis, basic statistics, regression, simulation, linear and nonlinear optimization, and discrete optimization. Computer Programming exercises, cases, and examples, deliver in SAS® (by the SAS Institute Inc.) are drawn from asset pricing, market microstructure, derivatives, and other functions.

Pre-requisite: None

BAGC7891 PROJECT REPORT

This Project Report gives the students an opportunity to apply the knowledge obtained from their previous studies in data science and their field of specialization. Students will be required to identify existing practical problems in their field of specialization. To develop solutions for the problems identified, they need to conduct detailed literature review, design appropriate research method, gather relevant data, analyze their data using big data analytic techniques, interpret their findings, and finally write up the entire project report.

Pre-requisite: Research Methods, Marketing Analytics [for students of MSc in Data Science (Big Data and Analytics in Marketing)] & FINC7010 Corporate Finance AND FINC7054 Introduction to Modern Financial Technology [for students of MSc in Data Science (Financial Technology)]

Specialization D: Data Strategy and Compliance

LAWS7701 DATA APPLICATIONS AND REGULATION IN DIGITAL SOCIETY

The evolution of data science and its applications in a digital society raise various legal and regulatory questions. This course aims to introduce the legal concepts and principles necessary to understand the pertinent rights and obligations as well as compliance requirements in the development and use of data applications. The course will identify the key legal issues facing diverse data applications and technologies and introduce applicable legal and regulatory regimes. The course will examine the scope and limitations of the relevant domestic and international laws governing the data applications within a digital society and in the context of cross-border transactions.

Pre-requisite: None

LAWS7702 BIG DATA ANALYTICS AND COMPLIANCE IN E-BUSINESS

Data analytics is emerging as a fundamental part of strategic planning and decision making in modern businesses. The success of a data-analytics embedded e-business strategy depends not only on proficient analytical models but also on the competence to address challenges and externalities that are beyond the control of individual enterprises. This course is aimed at nurturing the competence to identify and address various legal and compliance requirements impacting relevant data strategies. Legal and regulatory issues facing data applications in e-business including in business-to-business and business-to-consumer sectors and effective means to prevent and resolve related legal disputes will be covered.

Pre-requisite: None

LAWS7703 DATA STRATEGY AND PROTECTION IN HEALTHCARE AND E-GOVERNANCE

The course is designed to introduce students to gain an in-depth understanding of e-governance with an emphasis on regulatory frameworks for data security, information protection, and transparent governance. It examines legal challenges associated with the use of data collected by various smart applications for smart city plans. The course also gives a focused examination of digitalized healthcare and biomedical research, and the regulations that govern them. It

addresses not only privacy and security matters but also other important challenges, such as those related to data quality and data analysis in precision medicine and clinical research.

Pre-requisite: None

LAWS7704 ARTIFICIAL INTELLIGENCE AND COMPARATIVE LAW

Developing effective Artificial Intelligence (AI) applications entails the competence to identify relevant opportunities and challenges and address them strategically. This course aims to explore the nexus between AI and law and introduce contemporary and emerging issues in the field. It will study specific AI applications and identify related legal challenges and compare how key jurisdictions regulate such challenges. The course will cover potential legal risks and liability facing usage of AI and explore precautionary measures to limit liability. Contemporary legal issues in AI including data protection and privacy obligations, Intellectual Property Rights and regulation of algorithms will be comparatively studied.

Pre-requisite: None

LAWS7791 PROJECT REPORT

The Project Report serves the purpose of demonstrating the ability to systematically analyze the fundamental relationship between law and data applications and related strategies in a specific context. Students will identify, study, and critically examine key inter-disciplinary issues arising in the context of a chosen topic or a case study approved by the Faculty. The students may conduct a fundamental or applied research to seek practical solutions to legal and policy challenges facing formulation and implementation of effective data strategies. A faculty member competent in the selected legal field will supervise the project research and finally approve the project report.

Pre-requisite: None

Specialization E: Precision Medicine

HSCI7002 BIOMEDICAL SCIENCES

This course introduces the essential biological knowledge to students with non-biology background in order for them to understand, explain and evaluate the basic concepts of precision medicine. It uses cancer as a model disease to illustrate how precision medicine can provide better, individually tailored healthcare solutions to patients. The course introduces the methods of discovering the causes of cancer, the techniques to perform accurate diagnoses, the mechanisms of cancer therapies, and the different strategies for cancer treatment. In addition, basic knowledge on immunology, microbiology and infectious diseases will be introduced in this course, topics such as "Viruses," "Bacteria," "Immune System," "DNA analysis" will be added to the existing topics.

Pre-requisite: None

HSCI7003 DIGITAL BIO-MEDICINE

This course introduces the knowledge in digital medicine, technologies, and the associated big data and analysis to students with non-biology background, focusing on the public health issues with the global insights. Digital medicine is the convergence of digital technologies (including genomic technologies) with medicine, living, and society to enhance the efficiency of medicine delivery and make medicines more personalized and precise. This course covers high-throughput (HT) genotyping, HT phenotyping, artificial intelligence, big data analysis, public database, proteomics and other omics. The goal of this course is to develop students' understanding of digital medicine and required analytical skills for the exciting possibilities towards creating a new paradigm of precision medicine.

Pre-requisite: CISC7204 Data Science and Data Visualization

HSCI7004 HEALTHCARE ANALYTICS

Healthcare analytics is one of the fastest growing industries in our economy. Healthcare analytics allows for the examination of patterns in various healthcare data in order to determine how clinical care can be improved. This course introduces the essential elements of healthcare analytics to students with non-healthcare background, and provides them with an overview of population

health informatics, clinical informatics, imaging informatics, mobile healthcare and their contributions to precision medicine. The goal of this course is to develop students' understanding of healthcare analytics and analytical skills to comprehend healthcare data.

Pre-requisite: None

HSCI7001 ARTIFICIAL INTELLIGENCE IN MEDICINE

This course introduces the concept of artificial intelligence (AI) in medicine, the associated big data analysis, and analytic programming. Medical AI is the use of algorithms and software to approximate human cognition in the analysis of complex medical data including those in global public health. AI is currently transforming healthcare delivery and is augmenting doctors' roles in medicine. This course covers analytic programming (predominately in R), big data analysis, and application for AI in medicine and global public health. The goal of this course is to develop students' understanding and to confer hands-on analytical skills for AI in medicine on them. It also covers topics in global public health.

Pre-requisite: None

HSCI7998 PROJECT REPORT

An individual project provides the opportunity to plan and execute a significant project of research, investigation or development, and to integrate learning and put the techniques learnt throughout the master programme into practice under an academic supervision. Using large datasets from academia, hospitals, industry or government, students carry out high-level coordinated academic and practical work to solve a real-world problem in the field of biomedical sciences, medicine or healthcare, including collecting and processing real data, designing and implementing data science methods and tools, and applying, evaluating and critically assessing data analysis, visualization and prediction techniques to solve the real problem.

Pre-requisite: None

Specialization F: Computational Linguistics

AHGC7315 LANGUAGE AND LINGUISTICS

This course introduces key concepts and approaches to the study of language and linguistics. It provides an overview, with basic terminology, of the major subfields of linguistics, investigating the nature, history, and structure of language and how language relates to the mind, society, and education. It provides the basis of investigation in subsequent courses in the Computational Linguistics program. Students are encouraged to reflect on their own language experience and apply the theories covered in the course to their own linguistic context.

Pre-requisite: None

CISC7021 APPLIED NATURAL LANGUAGE PROCESSING

This course covers both the fundamental and advanced topics in Natural Language Processing (NLP), which deals with the application of computational models to text data. In this course, the core tasks in natural language processing will be examined, including minimum edit distance, language modelling, N vie Bayes, Maximum Entropy, text classification, sequence labelling, POS tagging, syntax parsing and computational lexical semantics. Modern NLP applications will be explored such as information retrieval, and statistical machine translation. Students will learn how to formulate and investigate research questions on related topics.

Pre-requisite: None

ENGL7022 CORPUS LINGUISTICS

This course will introduce students to the methods and issues involved in corpus linguistics. It aims to demonstrate the practical use of online corpora to explore questions asked by scholars of language, and to address some of the central issues raised by corpus design and analysis. Students will familiarize themselves with the research use of online corpora and the construction and analysis of original corpora using freeware concordance tools. At the same time, the classes will consider various aspects of language analysis concerning lexis and grammar, and questions

of language variation and change.

Pre-requisite: None

AHGC7039 COMPUTER-AIDED TRANSLATION

This course reviews state-of-the-art technology in translation. In addition to Translation Memory, which allows users to leverage existing data, deep learning technologies have allowed Machine Translation to achieve fully automatic translations for some genres of writing. The course will include an extensive practical component using these technologies in addition to exploring assessment of Machine Translation quality, emerging possibilities and issues. In addition to these, the use of the World Wide Web, Web-based translation aids and other applications for producing rapid, localized and high-quality translation are discussed.

Pre-requisite: None

AHGC7303 EVALUATION AND ASSESSMENT OF LANGUAGE USE

This course is an introduction to the field of language assessment. Topics covered in the course include purpose and context of testing, assessing skills and components of language ability, content analysis of test instruments, and statistical analysis of test performance data, and fairness and justice in language assessment.

Pre-requisite: None

CHLL7101 漢語語言學研究方法 METHODS IN CHINESE LINGUISTICS

本課程旨在系統介紹語言學的研究思路、方法和一些重要的語言學理論，指導學生採用科學的工具和方法對漢語進行共時或歷時的系統研究。課程包括語言學研究的一般方法和特殊方法，語言學研究中經常使用的工具性概念，各個語言學流派所採用的分析技術，國內學者建立的語言學理論等內容。

Pre-requisite: None

AHGC7308 SPECIAL TOPICS IN APPLIED LINGUISTICS I

This course is designed to offer visiting scholars, existing or future staff, the opportunity to offer courses in their particular area of specialization. The topic and content of the courses will vary from year to year depending on the availability of expert staff. Examples of specialized topics that may be offered include: data-driven learning, computer-adaptive language testing, automated scoring, corpus-based EAP (English for academic purposes), etc.

Pre-requisite: None

PHIL7101 TOPICS IN SEMANTICS

This course is an introduction to the formal analysis of natural language semantics as situated within the larger domain of linguistics. Students will be introduced to the main goals and methods of formal semantics, with a special focus on some of its core empirical results, and to some mathematical concepts underlying semantic interpretation systems (sets, relations, functions). Topics include: predication, the semantics of quantificational determiners, indexicals, semantic binding, tense, and modality.

Pre-requisite: None

AHGC7398 PROJECT REPORT

A "Project Report" addresses a particular issue in a specific context and may incorporate elements of data collection, data processing, data analysis and data solution. Students demonstrate their ability to reflectively examine a particular context, identify and define an issue in that context, access, summarize, and synthesize current literature relevant to the issue, and develop a justified approach to address that issue. Various linguistics and applied linguistics related topics are acceptable.

Pre-requisite: None

Specialization G: Analytics in Teaching and Learning**EDUC7041 ASSESSMENT AND EVALUATION OF EDUCATIONAL BIG DATA**

This course is designed to introduce graduate students to the application of big data in educational context, including the epistemological underpinnings of data science, in-depth knowledge of data science theories in education, and the methodological nuts-and-bolts in conducting educational evaluation.

Pre-requisite: None

EDUC7042 DATA-DRIVEN APPROACH TO EDUCATIONAL ADMINISTRATION

This course is to introduce prospective data scientists to data management in educational administration. Emphasis is placed on the use and repurposing of data to enhance governance and efficiency of school education as well as to formulate or update relevant policies and administrative measures emerged in response to changing social development or enactment of laws or rules.

Pre-requisite: None

EDUC7043 LEARNING ENHANCEMENT WITH BIG DATA

This course is designed to improve instruction using data. In the digital age, a wealth of data is available for teaching and learning purposes. This course aims to broaden students with the initiatives undertaken to make use of data-driven approaches that can improve the learning process. Students are expected to make use of tools to mine a wide range of learning patterns and behaviors so as to enhance the quality of instruction. They will study, experience and review the theory and practice of existing applications of big data in order to make informed judgment about their educational duties.

Pre-requisite: None

EDUC7044 QUANTITATIVE SOCIAL SCIENCE RESEARCH WITH BIG DATA

This course is designed to be part of the emerging field of quantitative/computational social sciences. The goal is to equip students with data science approach to answer social science questions. This course will introduce principles and skills of quantitative social science research. Students will receive an update of the major tools and ideas used in the field and be guided toward their first data-driven research project throughout this course.

Pre-requisite: None

SSGC7201 DATA CIVIC DATA ACQUISITION AND ANALYSIS

To promote studies using computational methods in social sciences, this course focuses on machine learning techniques and their applications in social sciences. By introducing principal ideas in statistical learning, the course will help students to understand the conceptual underpinnings of methods in data mining, how classical concepts of research design in the social sciences can be implemented in new data sources, and how these new data sources might require social scientists to update their thinking on research design. The course focuses more on the usage of existing software packages (mainly in R) than developing the algorithms by the students. Students will be required to work on projects to practice applying the existing software.

Pre-requisite: None

EDUC7098 PROJECT REPORT

Project Report is designed to encourage students in this program to participate in various projects and practices at different levels relevant to the use of big data and cultivate their abilities in collecting, managing, and processing big data in related areas of education independently. The Project Report should include the purpose, process and outcomes of participation in the project.

Pre-requisite: None

Specialization H: Smart Governance

SSGC7201 CIVIC DATA ACQUISITION AND ANALYSIS

To promote studies using computational methods in social sciences, this course focuses on machine learning techniques and their applications in social sciences. By introducing principal ideas in statistical learning, the course will help students to understand the conceptual underpinnings of methods in data mining, how classical concepts of research design in the social sciences can be implemented in new data sources, and how these new data sources might require social scientists to update their thinking on research design. The course focuses more on the usage of existing software packages (mainly in R) than developing the algorithms by the students. Students will be required to work on projects to practice applying the existing software. Pre-requisite: None

SSGC7202 BIG DATA AND SMART GOVERNANCE

This course is designed to teach students analytical techniques of dealing with open government data and other (usually big) data that are related to smart governance. We will focus on two types of data: text data and geo-spatial data.

Digitalized text represents an important source of data for social scientists. This is particularly true in political science, where a large amount of political information, otherwise difficult to analyze, is embodied in historical and contemporary speeches and documents that can be converted into digitalized text with increasing ease. Another source of text-based data come from online contents.

Pre-requisite: None

SSGC7203 ANALYSIS OF MEDIA AND OPINION DATA

This course introduces students to the theories and techniques of data analysis for monitoring and understanding media behavior and public opinion.

While theories of statistics, communication, media effects, and public opinion will be reviewed, the emphasis is on hands-on analysis and presentation of data. The objectives are two-folds 1) facilitate data-based policy making and decision making in government and cooperate settings; 2) facilitate data-based theory building in both applied and academic settings.

Pre-requisite: None

SSGC7204 MAKING SENSE OF SMART GOVERNANCE

Smart Governance is an essence for the development of smart city that stressing on the public-private collaboration for city management through the use of Information and Communication Technologies (ICTs). This course introduces the concept, main theories, and updated studies of smart governance, as well as integrate a course project with several assignments to offer practical skills training. After the first introductory lecture on smart governance, the course covers four key topics of SG: 1) major theories of governance in political science and public administration; 2) the practice of using IOT technologies to design and implement solutions for smart and sustainable governance in the context of China and beyond; 3) experimental social science techniques including survey experiment, field experiment, quasi-experiment (e.g., PSM, DID, RDD, IV), and natural experiment.

Pre-requisite: None

EDUC7044 QUANTITATIVE SOCIAL SCIENCE RESEARCH WITH BIG DATA

This course is designed to be part of the emerging field of quantitative/computational social sciences. The goal is to equip students with data science approach to answer social science questions. This course will introduce principles and skills of quantitative social science research. Students will receive an update of the major tools and ideas used in the field and be guided toward their first data-driven research project throughout this course.

Pre-requisite: None

SSGC7298 PROJECT REPORT

Project report gives the students an opportunity to apply the knowledge obtained from their previous studies in data science and field of specialization based on their interest. Students,

guided and supervised by individual instructor on a person-to-person basis, are required to independently and individually complete a research project on smart governance that subject with a report of no less than 4,000 words in length. Mini conferences would be organized by the academic year-end and students were required to deliver their projects which would be graded.
Pre-requisite: None

Master of Science - Cognitive Neuroscience

CCBS7001 PRINCIPLES OF NEUROSCIENCE

Introduction to the mammalian nervous system with emphasis on the structure and function of the human brain. Topics include the function of nerve cells, sensory systems, control of movement and speech, learning and memory, emotion, and diseases of the brain. No prerequisites, but knowledge of biology and chemistry at the high school level is assumed. The course also aims to have students to know the basic knowledge in functional aspects of nervous system organization, psychiatric and neurological disorders and molecular and cellular neurosciences.

Pre-requisite: None

CCBS7002 COGNITIVE NEUROSCIENCE

This course provides an introduction to the neuroscientific study of cognition. Topics surveyed in the course include the neural bases of perception, attention, memory, language, executive function, emotion, social cognition, and decision making. In covering these topics, the course will draw on evidence from brain imaging (fMRI, EEG, MEG), transcranial magnetic stimulation, electrophysiology, and neuropsychology. The course will also consider how knowledge about the brain constrains our understanding of the mind.

Pre-requisite: None

CCBS7003 BRAIN STIMULATION AND NEUROIMAGING TECHNIQUES

This course is one of the core introductory courses of the Programme that give and overview of the methodologies currently at place to study cognition and brain function based on neuroimaging and brain intervention techniques. Methods such as functional near-infrared spectroscopy (fNIRS), electroencephalography (EEG), magnetoencephalography (MEG), transcranial magnetic stimulation (TMS), Transcranial Direct Current Stimulation (tDCS) and Transcranial Alternating Current Stimulation (tACS), and others will be respectively introduced, which can provide the students with new insights into the structure and function of human brain. Nature and origin of electric, magnetic, light responses of human brain will be discussed throughout the course.

Pre-requisite: None

CCBS7098 PROJECT REPORT

A project report is required for all students completing the UM CNS Program. By the nature of this program, the performance of projects cuts across departmental boundaries, with faculty from neurobiology, psychology & neuroscience, radiology, psychiatry, biomedical science, engineering, neurology, biology, and philosophy. Thus, the program explicitly involves collaboration between FAH, FSS, FED, ICMS, FHS, and FBA. Students will join individual labs and be guided by Professors in different faculties. By doing a project, students will synthesize and integrate knowledge from their course work, apply it to a particular topic area, and communicate their ideas and findings through a scholarly written thesis. Additionally, students are encouraged to publish their thesis in academic journals.

Pre-requisite: None

CCBS7004 MAGNETIC RESONANCE IMAGING

In this course, basic MR-physics, spatial encoding, basic pulse sequences, MR image contrast in MR, MR hardware, practical considerations, general clinical applications of MRI, perfusion and diffusion MRI, and clinical MR spectroscopy will be introduced. In addition, introduction to functional MRI (fMRI) will provide students with the basic and practical principles underlying fMRI

of the brain. Students will complete the course having an in-depth introduction to neurophysiological mechanisms that couple magnetic resonance phenomenon to task- or stimulus dependent changes in neuronal activity and cerebral metabolism.

Pre-requisite: None

CCBS7005 COMPUTATIONAL COGNITIVE NEUROSCIENCE

This course will introduce a collection of computer simulation techniques useful for investigating a variety of cognitive phenomena involving perception, action, learning, and memory. This course is formatted to support interdisciplinary inquiry, with the backgrounds of students expected to vary broadly across the range of such disciplines as computer science, cognitive science, psychology, and neuroscience, as well as other related fields. The learning of both classic and contemporary methods for cognitive modeling will be facilitated by readings, presentations by class participants as well as by the instructor, homework assignments, a term project, and ample interaction and discussion between attendees.

Pre-requisite: None

CMED7018 BIO-STATISTICS

This course is designed for master students to understand the basic bio-statistics theory and skills. The course will also teach students how to use the most advanced bio-statistics software.

Pre-requisite: None

EDUC7402 PSYCHOLOGY OF LEARNING

This course introduces psychological theories pertinent to the learning of students, and current views of how people learn. Particular focus is placed on linking theories to classroom situations. Topics included are: behavioristic, information- processing, constructivistic, and humanistic theories of learning.

Pre-requisite: None

EDUC7503 ADVANCED EXERCISE PHYSIOLOGY

The programme introduces the nature of human body and examines its biological nature to the teaching and learning of physical education. Students will have chances to focus on human anatomy, exercise physiology and its biomechanics principles to development of movement exercises. The programme also aims to promote an understanding of the variety of laboratory and field skills used in the biomechanical assessment of the exercising human. The purpose is to enhance human performance growth in physical education and sport through the knowledge of body science.

Pre-requisite: None

EDUC7403 ADVANCED DEVELOPMENTAL PSYCHOLOGY

This course focuses on an integrated study of human development across the life span with implications for educational psychology. It aims at familiarizing students with current state of knowledge and major theories of human development with particular emphasis on childhood and adolescence. The interrelationship among biological, social-psychological, and educational factors that influence human development will be examined. In particular the influence of Chinese culture and context on development during the childhood and adolescence will be discussed.

Pre-requisite: None

AHGC7400 CLINICAL LINGUISTICS

This course provides a systematic study of linguistic theories, methods and findings concerning the description of natural language, Language acquisition and learning, intelligibility, normal and impaired speech, language developmental and acquired disorders. Covering areas of human speech development, production and perception, prosody, language variation and bilingualism, students will be able to understand how does brain process language, the effects of neurological disorders and brain injury on language use. They will become familiar with the tools most often used for language, speech and voice analysis, such as FEELtrace (evaluating dynamics of speech), Hoarseness Diagram (properties of normal and pathological voices) and PRAAT (speech

and phonetics analyses).

Pre-requisite: None

ENGL7004 PSYCHOLINGUISTICS

This course introduces students to the biological, neurological and cognitive bases for language, language development, multilingualism and second language acquisition, and language disorders. It will also deal with some aspects of natural language processing in relation to certain areas of linguistic analysis: phonology, the lexicon, morphology, syntax, semantics, and discourse.

Pre-requisite: None

AHGC7302 SECOND LANGUAGE ACQUISITION

This course will examine current theories of second language acquisition, in relation to the acquisitional process, developmental stages, and external factors conditioning acquisition, including the effects of the first language, age of acquisition, motivation, instructional context and the nature of input. Topics discussed will include the critical period hypothesis, cross-linguistic influences, individual differences such as cognition, affect and language aptitude.

Pre-requisite: None

ENGL7005 SOCIOLINGUISTICS

This course introduces key concepts and approaches to the sociolinguistics of bilingualism and multilingualism, with a particular focus on Chinese communities such as Macau, Hong Kong, Singapore, Taiwan and other Chinese cities. Topics covered include language use in bilingual/multilingual communities, language choice, language maintenance and shift, language attitudes and language ideologies, and language in globalization. Students are encouraged to reflect on their own bilingual or multilingual experience to apply the theories or models critically in their own social contexts. Not only classic papers but also current research articles will be discussed in the hope of providing the necessary background for students who consider writing their MA theses on topics of societal bilingualism or multilingualism.

Pre-requisite: None

ECEN7021 BIOMEDICAL TRANSDUCERS AND INSTRUMENTS

This essentially interdisciplinary course aims to introduce students the basic principles & techniques for biomedical transducers and instrumentations. This course covers sensing and measurement for qualitative description and quantitative analysis in biomedical engineering field mainly on noninvasive techniques.

Pre-requisite: None

CISC7026 INTRODUCTION TO DEEP LEARNING

This course introduces Deep Learning (DL) basics, methods, and algorithms, with hands-on practice using modern DL library tools (e.g., PyTorch). After the introductory lecture on deep learning, the course first covers the fundamental of neural networks, including universal approximator theory, learning neural networks, backpropagation, optimization, stochastic gradient descent, and tricks on training neural networks, and then focuses on typical neural network architectures, including Convolutional Neural Networks, Recurrent Neural Networks, and Generative Neural Networks.

Pre-requisite: For student of MSc Cognitive Neuroscience to take this course, basic knowledge is required in 1) Math, in particular, linear algebra, and 2) Programming skills with python

CISC7013 PRINCIPLES OF ARTIFICIAL INTELLIGENCE

Overview of Traditional Artificial Intelligence Principles: Problem Solving, and Logical Agent. Overview of Modern Artificial Intelligence Principles: Machine Learning, Decision Tree, Neural Networks, Support Vector Machines, and Introduction to Deep Learning.

Pre-requisite: None

CISC7202 TOOLS FOR MACHINE LEARNING

This course introduces Machine Learning (ML) basics, methods, and algorithms, with a significant amount of hands-on practice using modern software tools (e.g., Scikit-learn and PyTorch). After the first introductory lecture on machine learning, the course covers four key topics of ML: 1) regression techniques including linear regression, ridge and lasso regression, nearest neighbor and kernel regression; 2) classification techniques including logistic regression decision trees, boosting and bagging, SVM and Naïve Bayes; 3) clustering techniques including k-means, hierarchical clustering, DBScan, and mixture models; and 4) deep learning techniques including neural network basics, convolutional neural networks, and generative neural networks.

Pre-requisite: For student of MSc Cognitive Neuroscience to take this course, basic knowledge is required in 1) Math, in particular, linear algebra, and 2) Programming skills with python

PSYC7708 BEHAVIORAL ADDICTION

This course aims to be informative and practical. It focuses on developing learners' overall knowledge on the history, prevalence, theories, research, assessment, and interventions of different types of behavioral addiction, including gambling disorder, gaming disorder, internet/smartphone addiction, compulsive eating and buying, and workaholism. Specific attention will be paid to their biological, neurological, and cognitive features and mechanisms. Students will learn to identify different types of risk factors for the development and maintenance of behavioral addiction. Through team project and experiment participation, students will have hands-on experience of theory application and use of common assessment tools in the Chinese context.

Pre-requisite: None

IRTM7036 CROSS CULTURAL GAMBLING PSYCHOLOGY

This course focuses on the application of psychological knowledge to gambling behaviors. Topics include motivations, decision-making strategies, cognitive heuristics and biases, group and social influences, and pathological addictive gambling behaviors. Students will be able to better formulate organizational strategies for integrated resorts and enhancing both their communication and analytical skills.

Pre-requisite: None

CCBS7006 NEUROECONOMICS

Neuroeconomics is the study of human behavior, decision making in particular, by adopting the value-based approach in economics and through the use the neuroscientific methodologies. Behavioral economics is a confluence of economics, psychology and neuroscience. The course will start with some normative theory from economics. Yet decision makers do not behave "rationally" as required by the classical economic theory. These psychological insights will be discussed based on the theoretical frameworks in behavioral economics such as behavioral decision theory and behavioral game theory. We will then survey the neuroscientific studies motivated by these theories.

Pre-requisite: None