

PROGRAMMES OF STUDY

## **Faculty of Health Sciences**

### **Doctoral Degree Programme**

#### AREA OF STUDY

- Biomedical Sciences

## Doctoral Degree Programme

### Doctor of Philosophy

#### • Biomedical Sciences

<b>Compulsory Major</b>		<b>Credits</b>
HSCI8003	Research Ethics	--
HSCI8004	Methodologies in Biomedical Sciences	3
HSCI8005	Critical Scientific Reading, Writing and Analysis	3
HSCI8006	Advanced Molecular Cell Biology	3

  

<b>Required Elective</b>		<b>Credits</b>
<i>Students are required to take 1 course from the following:</i>		3
HSCI8118	Advanced Genetics and Bioinformatics	
HSCI8119	Advanced Biomedical and Chemical Engineering	

  

<b>Doctoral Thesis</b>		<b>Credits</b>
HSCI8999	Doctoral Thesis	18

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<b>Total Credits:</b>	<b>30</b>
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FACULTY OF HEALTH SCIENCES

## Master's Degree Programme

### Master of Science

#### • Global Public Health

<b>Compulsory Major</b>		<b>Credits</b>
CMED7018	Bio-Statistics	3
HSCI7002	Biomedical Sciences	3
HSCI7005	Toxicology and Environmental Health	3
HSCI7006	Epidemiology	3
HSCI7007	Advanced Nutrition and Food Safety	3
HSCI7008	Health Systems and Policy	3
HSCI7009	Case Analysis of Global Health Crisis: Managing Epidemics	3
<b>Required Elective</b>		<b>Credits</b>
<i>Students are required to take 1 course from the following:</i>		3
CMED7004	Social Medicine	
HSCI7001	Artificial Intelligence in Medicine	
HSCI7003	Digital Biomedicine	
HSCI7004	Healthcare Analytics	
<b>Project Report</b>		<b>Credits</b>
HSCI7898	Project Report	6
<b>Total Credits:</b>		<b>30</b>

## Bachelor's Degree Programmes

### Bachelor of Science

- **Biomedical Sciences**

Year I		Credits
<b>Compulsory Major</b>		
APAC1004	General Physics	4
APAC1005	Physics Lab	1
HSCI1000	General Chemistry	3
HSCI1001	General Chemistry Lab	2
HSCI1002	Introduction to Biological Sciences	3
HSCI1003	General and Clinical Biochemistry	3
HSCI1004	Biochemistry Lab	1.5
HSCI1005	Organic Chemistry	4
HSCI1006	Organic Chemistry Lab	2
MATH1007	Introduction to Probability	1
<b>Languages and Skills*</b>		
	English Language Courses or Free Electives	6
<b>Community and Peer Education</b>		
		3
<b>General Education</b>		
GELH1000	Chinese Language and Culture (Area of Literature & Humanities)	3
GEST1003	Quantitative Reasoning for Health Sciences (Area of Science & Technology)	3
<b>Total Credits:</b>		<b>39.5</b>

<b>Year II</b>		<b>Credits</b>
<b>Compulsory Major</b>		
CISC1001	Programming Science	3
CISC1004	Introduction to Computer Science	3
HSCI2000	Cell and Molecular Biology	3
HSCI2001	Cell and Molecular Biology Lab	1.5
HSCI2002	General and Clinical Microbiology	3
HSCI2003	Microbiology Lab	1.5
HSCI2004	Genetics and Epigenetics	3
HSCI2006	Physiology and Pathophysiology	3
HSCI2007	Physiology Lab	1.5
HSCI2008	Human Anatomy	3
HSCI3002	Immunology and Infectious Diseases	3
HSCI3003	Biostatistics and Experimental Design	3
<b>Languages and Skills*</b>		
	English Language Course or Free Elective	3
	Chinese/Portuguese Language Course or Free Elective	3
<b>General Education</b>		
	1 General Education Course	3
<b>Total Credits:</b>		<b>40.5</b>
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<b>Year III</b>		<b>Credits</b>
<b>Compulsory Major</b>		
HSCI2005	Biology of Development and Aging	3
HSCI3000	Neuroscience and Neurodegenerative Diseases	3
HSCI3001	Endocrinology and Metabolic Diseases	3
HSCI3004	Genomics and Bioinformatics	3
HSCI3005	Genetics, Genomics and Bioinformatics Lab	1.5
<b>General Education</b>		
GEGA1000	Macao and Chinese Civilization (Area of Global Awareness)	3
GESB1000	Ethics, Values, Law and Society (Area of Society & Behaviour)	3
	2 General Education Courses	6
<b>Languages and Skills*</b>		
CISC1000	Information Technology Fundamentals and Practices	3
<b>Total Credits:</b>		<b>28.5</b>

<b>Year IV</b>		<b>Credits</b>
<b>Compulsory Major</b>		
HSCI4000	Graduation Project I	3
HSCI4001	Cancer Biology and Therapy	3
HSCI4002	Stem Cell Biology and Regenerative Medicine	3
HSCI4005	Graduation Project II	3
HSCI4006	Public Health	3
HSCI4007	Translational Medicine	3
<b>Required Elective</b>		
<i>Students are required to take 1 course from the following:</i>		3
HSCI2009	Pharmacology	
HSCI4004	Drug Discovery and Development	
HSCI4009	Toxicology	
<b>General Education</b>		
	1 General Education Course	3
<b>Total Credits:</b>		<b>24</b>

		<b>Credits</b>
<b>Grand Total:</b>		<b>132.5</b>

\*Students who test out of some or all of the Languages and Skills course(s) are required to make up the credits by taking additional Free Elective(s). Please visit the Registry's webpage (<https://reg.um.edu.mo/current-students/curriculum-model/ug-curriculum-model/languages-and-skills/>) for more details about the test out criteria.

FACULTY OF HEALTH SCIENCES

## Bachelor's Degree Programmes

### Bachelor of Science

- **Bioinformatics**

Year I		Credits
<b>Compulsory Major</b>		
HSCI1000	General Chemistry	3
HSCI1002	Introduction to Biological Sciences	3
HSCI1003	General and Clinical Biochemistry	3
HSCI1004	Biochemistry Lab	1.5
MATH1001	Linear Algebra I	3
MATH1007	Introduction to Probability	1
<b>Languages and Skills*</b>		
	English Language Courses or Free Electives	6
	Chinese/Portuguese Language Course or Free Elective	3
<b>Community and Peer Education</b>		2
<b>General Education</b>		
GELH1000	Chinese Language and Culture (Area of Literature & Humanities)	3
GEST1003	Quantitative Reasoning for Health Sciences (Area of Science & Technology)	3
	1 General Education Course	3
<b>Total Credits:</b>		<b>34.5</b>

<b>Year II</b>		<b>Credits</b>
<b>Compulsory Major</b>		
CISC1001	Programming Science	3
CISC1004	Introduction to Computer Science	3
HSCI2000	Cell and Molecular Biology	3
HSCI2001	Cell and Molecular Biology Lab	1.5
HSCI2002	General and Clinical Microbiology	3
HSCI2004	Genetics and Epigenetics	3
HSCI2006	Physiology and Pathophysiology	3
HSCI3002	Immunology and Infectious Diseases	3
HSCI3003	Biostatistics and Experimental Design	3
<b>Languages and Skills*</b>		
	English Language Course or Free Elective	3
CISC1000	Information Technology Fundamentals and Practices	3
<b>Community and Peer Education</b>		1
<b>General Education</b>		
GEGA1000	Macao and Chinese Civilization	3
<b>Total Credits:</b>		<b>35.5</b>
<b>Year III</b>		<b>Credits</b>
<b>Compulsory Major</b>		
CISC2003	Object Oriented Programming and Data Structures	3
CISC3000	Introduction to Database Systems	3
HSCI2008	Human Anatomy	3
HSCI3004	Genomics and Bioinformatics	3
HSCI3005	Genetics, Genomics and Bioinformatics Lab	1.5
HSCI3006	Advanced Bioinformatics	3
HSCI3016	Evolutionary Biology	3
HSCI3017	Medical Genetics	3
<b>Required Elective</b>		
	2 Required Elective Courses	6
<b>General Education</b>		
GESB1000	Ethics, Values, Law and Society (Area of Society & Behaviour)	3
	1 General Education Course	3
<b>Total Credits:</b>		<b>34.5</b>



Year IV		Credits
<b>Compulsory Major</b>		
HSCI4000	Graduation Project I	3
HSCI4005	Graduation Project II	3
HSCI4006	Public Health	3
HSCI4007	Translational Medicine	3
HSCI4011	Pharmacoinformatics	3
HSCI4012	Bioinformatics in Action	3
<b>Required Elective</b>		
	1 Required Elective Course	3
<b>General Education</b>		
	2 General Education Courses	6
<b>Total Credits:</b>		<b>27</b>
		<b>Credits</b>
<b>Grand Total:</b>		<b>131.5</b>

<b>List of Required Elective Courses:</b>		Credits
CISC1006	Probability and Statistics	3
CISC2002	Numerical Methods and Computation	3
CISC3011	Digital Image Processing	3
CISC3012	Artificial Intelligence	3
CISC3015	Data and Information Visualization	3
CISC3023	Machine Learning	3
HSCI3014	Pharmacy Administration	3
HSCI4010	Pharmaceutical Economics and Policy	3

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## Bachelor's Degree Programmes

### Bachelor of Science

#### • Pharmaceutical Sciences and Technology

Year I	Credits
<b>Compulsory Major</b>	
APAC1004 General Physics	4
APAC1005 Physics Lab	1
CISC1004 Introduction to Computer Science	3
HSCI1000 General Chemistry	3
HSCI1001 General Chemistry Lab	2
HSCI1002 Introduction to Biological Sciences	3
HSCI1003 General and Clinical Biochemistry	3
HSCI1004 Biochemistry Lab	1.5
HSCI1005 Organic Chemistry	4
HSCI1006 Organic Chemistry Lab	2
MATH1007 Introduction to Probability	1
<b>Languages and Skills*</b>	
English Language Courses or Free Electives	6
<b>Community and Peer Education</b>	
	2
<b>Total Credits:</b>	<b>35.5</b>

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<b>Year II</b>		<b>Credits</b>
<b>Compulsory Major</b>		
APAC3005	Physical Chemistry	3
CISC1001	Programming Science	3
HSCI2002	General and Clinical Microbiology	3
HSCI2003	Microbiology Lab	1.5
HSCI2006	Physiology and Pathophysiology	3
HSCI2008	Human Anatomy	3
HSCI2009	Pharmacology	3
HSCI2010	Pharmacology Lab	1.5
HSCI2011	Analytical Chemistry	3
HSCI2012	Analytical Chemistry Lab	2
HSCI2013	Medicinal Chemistry	3
HSCI3003	Biostatistics and Experimental Design	3
<b>Languages and Skills*</b>		
	English Language Course or Free Elective	3
<b>Community and Peer Education</b>		1
<b>Total Credits:</b>		<b>36</b>

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<b>Year III</b>		<b>Credits</b>
<b>Compulsory Major</b>		
HSCI3008	Biopharmaceutics and Pharmacokinetics	3
HSCI3009	Chinese Medicine	3
HSCI3010	Pharmaceutics	3
HSCI3011	Pharmaceutics Lab	1.5
HSCI3012	Pharmaceutical Analysis	3
HSCI3013	Pharmaceutical Analysis Lab	1.5
HSCI3014	Pharmacy Administration	3
<b>Required Elective</b>		
	1 Required Elective Course	3
<b>Languages and Skills*</b>		
CISC1000	Information Technology Fundamentals and Practices	3
<b>General Education</b>		
GEA1000	Macao and Chinese Civilization (Area of Global Awareness)	3
GESB1000	Ethics, Values, Law and Society (Area of Society & Behaviour)	3
	1 course from area of Society and Behaviour	3
	1 course from area of Science and Technology	3
<b>Total Credits:</b>		<b>36</b>

<b>Year IV</b>		<b>Credits</b>
<b>Compulsory Major</b>		
HSCI4000	Graduation Project I	3
HSCI4005	Graduation Project II	3
HSCI4009	Toxicology	3
<b>Required Elective</b>		
	2 Required Elective Courses	6
<b>Languages and Skills*</b>		
	Chinese/Portuguese Language Course or Free Elective	3
<b>General Education</b>		
GELH1000	Chinese Language and Culture (Area of Literature & Humanities)	3
GEST1004	Quantitative Reasoning for Health Sciences (Area of Science & Technology)	3
	1 course from area of Literature and Humanities	3
	1 course from area of Global Awareness	3
<b>Total Credits:</b>		<b>30</b>

		<b>Credits</b>
<b>Grand Total:</b>		<b>137.5</b>

<b>List of Required Elective Courses:</b>		<b>Credits</b>
HSCI3007	Biomedical Materials	3
HSCI3015	Phytochemistry	3
HSCI4004	Drug Discovery and Development	3
HSCI4006	Public Health	3
HSCI4007	Translational Medicine	3
HSCI4010	Pharmaceutical Economics and Policy	3
HSCI4011	Pharmacoinformatics	3

\* Students who test out of some or all of the Languages and Skills course(s) are required to make up the credits by taking additional Free Elective(s). Please visit the Registry's webpage (<https://reg.um.edu.mo/current-students/curriculum-model/ug-curriculum-model/languages-and-skills/>) for more details about the test out criteria.

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## Course Description

### DOCTORAL DEGREE PROGRAMME

#### **HSCI8003 RESEARCH ETHICS**

This course provides students with an understanding of the need for research ethics and the responsibility of the researcher (the student); the most common types of academic dishonesty (such as fabrication and plagiarism); how to avoid committing acts of academic dishonesty (such as through using citations and references); and how the University deals with students who have been proven to have committed acts of academic dishonesty (The University's 'Rules on Handling Student Academic Dishonesty' will be outlined).

Pre-requisite: None

#### **HSCI8004 METHODOLOGIES IN BIOMEDICAL SCIENCES**

This course aims to equip students with basic knowledge and general techniques commonly used in Biomedical Science research. Students will learn the scientific jargon, basic biology, and theories associated with each technique so that students can perform and understand common research methods. This course aims to help them with their research, project design, Qualifying Examination and graduate with PhD in "Biomedical Sciences".

Pre-requisite: None

#### **HSCI8005 CRITICAL SCIENTIFIC READING, WRITING AND ANALYSIS**

This course aims to provide training and instruction in the methods and practice of critically reading, writing, and analysing scientific text. Students will learn reading strategies, annotation methods, and techniques in outlining and summarizing a text. Students will also learn essential structure and writing techniques for manuscripts and proposals. The course is activity based and students will participate in reading, analysing, and writing exercises.

Pre-requisite: None

#### **HSCI8006 ADVANCED MOLECULAR CELL BIOLOGY**

This course aims to provide a comprehensive coverage at advanced level on topics in molecular and cell biology, such as DNA and Gene Editing, Gene Expression, Cytoskeleton and Intracellular Mobility, Mitochondria and Bioenergetics, ER-Golgi and Protein Sorting, Proteasome and Protein Degradation, Lysosome and Autophagy, cell signalling, cell cycle, cell death, etc. This course is taught by professors from FHS with the relevant background. The model of teaching includes both lecture and paper discussion. The students are assessed via closed-book essay questions.

Pre-requisite: None

#### **HSCI8118 ADVANCED GENETICS AND BIOINFORMATICS**

The course aims to provide advanced knowledge in genetics and bioinformatics, new progress in both theoretical and methodological aspects, and future perspectives in the field. It combines the lecture and literature analysis, with student presentation and discussion on specific topics.

Pre-requisite: None

#### **HSCI8119 ADVANCED BIOMEDICAL AND CHEMICAL ENGINEERING**

This course aims to provide the students the underlying principles of biomedical imaging X-ray CT, SPECT, PET, optical imaging, and MRI; emphasize emerging nanotechnologies and biomedical applications including nanomaterials, nanoengineering, nanotechnology-based drug delivery systems, nano-based imaging and theranostic systems, nanotoxicology, and translating nanomedicines into clinical investigation; and explore the process of drug development, from target identification to final drug registration, involving target selection, lead discovery using computer-based methods, combinatorial chemistry/highthroughput screening, safety evaluation, bioavailability, clinical trials, and the essentials of patent law.

Pre-requisite: None

**HSCI8999 DOCTORAL THESIS**

During the study period, students are required to perform independent research work under the supervision of the thesis supervisor. After successfully completing the qualifying examination and proposal assessment, a written thesis and an oral defence presenting the research findings with intellectual analysis are necessary for the assessment of the eligibility of graduation by the end of the study.

Pre-requisite: None

**MASTER'S DEGREE PROGRAMME****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 is also covers topics in global public health.

Pre-requisite: None

**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 BIOMEDICINE**

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: None

**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 nonhealthcare 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

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### **HSCI7005 TOXICOLOGY AND ENVIRONMENTAL HEALTH**

The course covers basic concepts, knowledge and methods in toxicology, including the disposition of toxic substances by the body, how toxic substances react with biomolecules and lead to target organ toxicity / non-organ directed toxicity, knowledge about toxic substances, as well as applications of toxicology in environmental health and other application areas.

Pre-requisite: None

### **HSCI7006 EPIDEMIOLOGY**

The course covers basic principles in epidemiology and risk management, including the tools of epidemiology, methods involved in measuring disease frequency, causes, morbidity, and mortality of diseases. Additionally, the course is designed to help students to apply the epidemiological knowledge to the real case studies and to find solution for the disease control and public policy. Finally, the course will prepare students to critically evaluate published epidemiological studies and communicate the scientific findings with science community, government policymakers, and general population in community.

Pre-requisite: None

### **HSCI7007 ADVANCED NUTRITION AND FOOD SAFETY**

The course provides students with the advanced knowledge on human nutrition and food safety with the huge rise in diet-related health problem and in food safety emergencies. It focuses on nutrition and human health, and food safety problem (e.g. microbes, pesticides, food additives, allergens, industrial chemicals, and hazardous substances during cooking), as well as food risk assessment and management. It also introduces students to the serious effects of diet-related diseases/disorders and provides them with the knowledge of food risk assessment and management. This course is of great interest to students because its contents are relevant to our daily life.

Pre-requisite: None

### **HSCI7008 HEALTH SYSTEMS AND POLICY**

This course aims to introduce how global health systems function, how health policy is shaped and implemented, and the role of health system research for evidence-based policy-making and implementation. There are two key aspects to this course: (1) knowledge and understanding; and (2) skills and abilities. To help students build their knowledge background in global health systems and policy, major theories and frameworks for health systems and policies and how they are applied in different national contexts are introduced. A systematic approach in learning the interrelationship of context, content, process and actions during health policy development are covered. An integration of such knowledge into the analysis of health systems and policy implications, and the formulation of skillset required to participate in health systems research and development work are also emphasized.

Pre-requisite: None

### **HSCI7009 CASE ANALYSIS OF GLOBAL HEALTH CRISIS: MANAGING EPIDEMICS**

Public health emergencies take a terrible toll, both on human life and global economy. This course introduces strategies for managing epidemics, using COVID-19, SARS, AIDS (HIV), pandemic influenza, Ebola virus disease, yellow fever, Zika, cholera, and plague as examples. It covers the pathophysiology of different diseases, the principles of testing, tracing and isolation (TTI), the expert guidance from World Health Organization (WHO) for effective epidemic responses, and lessons learned from success and failure in managing epidemics.

Pre-requisite: None

### **HSCI7898 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. Students carry out high-level coordinated academic and practical work with an aim to solve a real global problem in public



health, including collecting and processing real data, designing and implementing analytical methods and tools, and applying, evaluating and critically assessing data analysis, visualization and prediction techniques.

Pre-requisite: None

## **BACHELOR'S DEGREE PROGRAMME**

### **HSCI1000 GENERAL CHEMISTRY**

This course introduces the fundamental principles and concepts of chemistry to lay a foundation for future learning for students majoring in health sciences. The major areas covered in this course include atomic and molecular structure, chemical reactions and stoichiometry, energy and thermochemistry, chemical bonding, gases, chemical kinetics, chemical equilibrium, and introductory organic chemistry.

Pre-requisite: None

### **HSCI1001 GENERAL CHEMISTRY LAB**

This laboratory course supplements the lecture course General Chemistry and provides students with hands on learning experience on qualitative and quantitative experimental techniques for investigating the properties and reactions of chemical substances.

Pre-requisite: HSCI1000 General Chemistry (or concurrent enrolment)

### **HSCI1002 INTRODUCTION TO BIOLOGICAL SCIENCES**

This course covers the fundamental aspects or principles of biological and biomedical sciences, and topics include: basic units of life, genetic basis of life, evolution and biodiversity, development and function, and ecology and environment. Although all three domains or five kingdoms of life will be covered, the course will focus more on animals and humans.

Pre-requisite: None

### **HSCI1003 GENERAL AND CLINICAL BIOCHEMISTRY**

This course introduces the molecular basis of biological processes through the logic of chemistry. Topics covered include the structure and function of biomolecules, biochemistry techniques, basic metabolic pathways, and a brief introduction to the biochemical bases of relevant disease states.

Pre-requisite: None

### **HSCI1004 BIOCHEMISTRY LAB**

This course aims to provide a hands-on opportunity for students to learn the basic experimental methods and instruments used in a biochemistry laboratory, and develop analytical and problem solving skills that will be required for the pursuit of their career in the health science area. Major topics covered include protein expression, concentration determination and gel electrophoresis, western blotting, chromatography, and enzyme kinetics. Students will also practice literature search and data presentation through the semester.

Pre-requisite: HSCI1003 General and Clinical Biochemistry (or concurrent enrolment)

### **HSCI1005 ORGANIC CHEMISTRY**

This course aims to provide students with an understanding of the basic principles of organic chemistry. Topics covered include nomenclature, structure, properties, stereochemistry, synthesis, and reactions of the major classes of organic compounds including hydrocarbons, alkyl halides, alcohols, ethers, aldehydes, ketones, carboxylic acids and their derivatives, aromatic compounds, amines, carbohydrates, amino acids, and nucleic acids. Further topics cover spectroscopic analysis of organic compounds.

Pre-requisite: HSCI1000 General Chemistry

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### **HSCI1006 ORGANIC CHEMISTRY LAB**

This laboratory course supplements the lecture course Organic Chemistry and provides students learning experience in hands on experimental techniques. The course covers basic experimental skills in organic chemistry, including the synthesis of common organic compounds, the selection of synthetic route, and the characterization of organic compounds. Students observe and record experimental phenomena, identify problems, analyse problems, and develop problem-solving skills.

Pre-requisites: HSCI1000 General Chemistry  
HSCI1001 General Chemistry Lab  
HSCI1005 Organic Chemistry (or concurrent enrolment)

### **HSCI2000 CELL AND MOLECULAR BIOLOGY**

This course aims to provide an introduction to the principles of modern cell and molecular biology, and build a foundation for students to initiate and develop the process of inquiry-based learning and discovery in biology and medical sciences. The course discusses fundamental molecular biology of the cell, current molecular genetic techniques, cell structure and function, and signal transduction pathways.

Pre-requisite: HSCI1002 Introduction to Biological Sciences

### **HSCI2001 CELL AND MOLECULAR BIOLOGY LAB**

This laboratory course applies concepts learned in Cell and Molecular Biology lecture to a molecular biology research project, with an aim to introduce students to in vitro techniques utilized in a modern biological research lab. While it is not possible to cover all the methods and technologies in a single semester, the fundamental skills taught in this course will provide a basis for understanding many more complex approaches. Topics covered include ribose nucleic acid (RNA) isolation, agarose gel electrophoresis, polymerase chain reaction, restriction enzyme digestion, deoxyribose nucleic acid (DNA) cloning, bacterial transformation, plasmid deoxyribose nucleic acid (DNA) isolation, mammalian cell culture, deoxyribose nucleic acid (DNA) transfection, fluorescence microscopy, and subcellular fractionation.

Pre-requisites: HSCI1002 Introduction to Biological Sciences  
HSCI2000 Cell and Molecular Biology (or concurrent enrolment)

### **HSCI2002 GENERAL AND CLINICAL MICROBIOLOGY**

This course provides students with a broad-based foundation in the basic concepts of general and clinical microbiology. Topics covered include an overview of microbiology with basic information on bacteria, fungi, protozoa and viruses, a discussion of microbial physiology and genetics, and an introduction to microbial pathogenesis and the host response, providing a conceptual basis for understanding pathogenic microorganisms and the mechanisms by which they cause diseases in the human body. Successful completion of this course will prepare students for more advanced courses in related fields.

Pre-requisites: HSCI1002 Introduction to Biological Sciences  
HSCI1003 General and Clinical Biochemistry (except FED-INS programme)

### **HSCI2003 MICROBIOLOGY LAB**

This course provides an opportunity for students to gain hands-on experience on basic microbiology methods and techniques. Topics covered include basic microscopy, aseptic technique, media preparation, bacterial growth and culture, staining methods, biochemical tests of microbes, effects of physical and chemical agents on bacteria, and eukaryotic organisms and viruses.

Pre-requisite: HSCI2002 General and Clinical Microbiology (or concurrent enrolment)

### **HSCI2004 GENETICS AND EPIGENETICS**

This course introduces the basic principles of classical genetics, molecular genetics and epigenetics and explains how biological information is stored and expressed. Students will understand how changes in genetic information (e.g. deoxyribose nucleic acid (DNA)) will affect gene function and may lead to diseases and learn about what information can be obtained from

deoxyribose nucleic acid (DNA) sequencing. Topics covered include inheritance, gene structure, expression and regulation, molecular genetic techniques, population and evolutionary genetics, followed by a discussion of the role of epigenetics in biological phenomena.

Pre-requisite: None

### **HSCI2005 BIOLOGY OF DEVELOPMENT AND AGING**

This course discusses animal development with focus on initiation and construction of an organism and the underlying molecular and genetic basis. Topics covered include an overview of developmental biology, the molecular mechanisms of development, cell commitment and early embryonic development, and the vertebrate development process. A final section is devoted to a discussion of the aging process, including the evolutionary, biochemical, genetic and cellular mechanisms of aging, as well as age-related diseases.

Pre-requisites: HSCI1002 Introduction to Biological Sciences  
HSCI2000 Cell and Molecular Biology

### **HSCI2006 PHYSIOLOGY AND PATHOPHYSIOLOGY**

This course provides an introduction to the structure and function of the major physiological organ systems of the human body, how various body processes are integrated and regulated, and how perturbations in physiological regulatory mechanisms and anatomy result in pathophysiology. Common diseases and disorders of each system are covered, and emphasis is given on cardiovascular, pulmonary, hepatic, renal and reproductive systems.

Pre-requisites: HSCI1003 General and Clinical Biochemistry  
HSCI2000 Cell and Molecular Biology

### **HSCI2007 PHYSIOLOGY LAB**

This course aims to provide an opportunity for students to learn the basic experimental skills of physiology and to develop analytical and problem solving skills for studying human physiology and the whole biomedical sciences. Major experiments to be covered include experiments on endocrine system, cardiovascular system, respiratory system, digestive system and urinary-reproductive system. In some experiments, lab animals are used.

Pre-requisite: HSCI2006 Physiology and Pathophysiology (or concurrent enrolment)

### **HSCI2008 HUMAN ANATOMY**

This course introduces human anatomy and histology, the concept of primary tissues, the basic embryology of the nervous, cardio-vascular, gastrointestinal and musculoskeletal systems. Clinical relevance of the anatomy is also emphasized.

Pre-requisite: HSCI1002 Introduction to Biological Sciences

### **HSCI2009 PHARMACOLOGY**

This course provides the introductory overview of the pivotal role played by pharmacology in drug development and the multidisciplinary nature of drug discovery. Major areas covered include molecular mechanisms as well as systematic effects of drugs. Appropriate methods and analysis for investigating and evaluation of the pharmacological effects in drug development are discussed with examples of commonly used medical drugs and new medicines development.

Pre-requisite: HSCI1002 Introduction to Biological Sciences

### **HSCI2010 PHARMACOLOGY LAB**

This course provides laboratory practice experience to students, and allows them to involve in the basic drug-discovery pipeline in person. It focuses on the evaluation of mechanisms of drug action, drug-receptor interaction, receptor target distribution, and systematic metabolism, and toxicity. Students learn the practical skills of how to evaluate pharmacological effects of medicine, and get up-to-date information on drugs used in the clinics.

Pre-requisite: HSCI2009 Pharmacology (or concurrent enrolment)

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### **HSCI2011 ANALYTICAL CHEMISTRY**

This course introduces the basic theory, principle and knowledge of chemical analysis and instrumental analysis, which include titrimetric analysis, gravimetric analysis, electrochemical analysis, spectroscopic analysis and chromatographic analysis. Sampling, error and statistical analysis applied to analytical chemistry are also included.

Pre-requisite: HSCI1000 General Chemistry

### **HSCI2012 ANALYTICAL CHEMISTRY LAB**

This course introduces the experimental methods, instruments and data analysis used in analytical chemistry to the students, and assists the students in developing analytical and problem solving skills that are required for the pursuit of their career in the area of pharmaceutical science. Major topics covered include titrimetric analysis, gravimetric analysis, electrochemical analysis, spectroscopic analysis and chromatographic analysis. Students are required to perform literature search and data presentation during the semester.

Pre-requisites: HSCI1001 General Chemistry Lab

HSCI2011 Analytical Chemistry (or concurrent enrolment)

### **HSCI2013 MEDICINAL CHEMISTRY**

This course covers the chemical principles of drug design and drug action and provides an introduction to research in areas of bioorganic chemistry, bioinorganic chemistry, medicinal chemistry, pharmaceutical chemistry, and biotechnology.

Pre-requisite: HSCI1005 Organic Chemistry

### **HSCI3000 NEUROSCIENCE AND NEURODEGENERATIVE DISEASES**

This course aims to provide a systematic introduction to the mammalian nervous system. Topics covered include basic neuroanatomy, the electrophysiological properties of neural cells, sensory and motor systems, the structural and functional organization of the human brain, and an introduction to neural degenerative diseases.

Pre-requisite: HSCI2006 Physiology and Pathophysiology

### **HSCI3001 ENDOCRINOLOGY AND METABOLIC DISEASES**

The course introduces the roles of hormones, the pathophysiologic process by which hormonal secretion is abnormal, and characteristics and treatments of various endocrine disorders to students. A number of metabolic diseases that pertain to defects in hormone production or signaling are covered in the course. Main topics in the course include principles and practice of endocrinology, adrenal disorders, metabolic diseases, thyroid hormones and disorders, calcium homeostasis and metabolic bone disease, pituitary hormones and pituitary gland disorders, sex hormone disorders, and endocrine emergencies.

Pre-requisite: HSCI2006 Physiology and Pathophysiology

### **HSCI3002 IMMUNOLOGY AND INFECTIOUS DISEASES**

This course provides a basic knowledge of the immune response and its involvement in health and disease, as well as an introduction to infectious disease, including the pathophysiology, clinical presentation and therapeutic management of common infectious diseases. Knowledge from this course enables students to gain a broad foundation base and prepares them for advanced courses in the health care or medical research field.

Pre-requisite: HSCI2002 General and Clinical Microbiology

### **HSCI3003 BIostatISTICS AND EXPERIMENTAL DESIGN**

This course provides students with an understanding of basic concepts of data analysis and statistical inference in the medical and health sciences, with an emphasis on the application of statistical methods to the design and interpretation of biological experiments and comparative data. Specific topics include tools for describing central tendency and variability in data, methods for performing inference on population means and proportions via sample data, statistical hypothesis testing and its application to group comparisons, issues of power and sample size in study designs, and random sample and other study types.

Pre-requisite: None

**HSCI3004 GENOMICS AND BIOINFORMATICS**

This course introduces fundamental concepts and tools in genomics and bioinformatics to provide students with a foundation for doing innovative research. The course emphasizes on various types of functional genomic data available and current computational methods for interpreting and integrating the data to make inferences about cellular function. Topics covered include an introduction to genomics and bioinformatics, genomic sequencing, assembly and annotation, transcriptomics, proteomics, and application of genomic approaches.

Pre-requisite: HSCI2000 Cell and Molecular Biology

**HSCI3005 GENETICS, GENOMICS AND BIOINFORMATICS LAB**

This laboratory course aims to provide students a hands-on experience through a series of laboratory experiments, designed to examine various genetics phenomenon in order to better understand fundamental genetics principles. In addition, students carry out experiments and data analysis related to the fields of genetics, genomics and bioinformatics, such as deoxyribose nucleic acid (DNA) and protein sequence analysis, data mining from different types of research databases, basic Bioinformatics analysis of next generation sequencing data, etc. This course equips students with the basic knowledge to solve biological questions using a genetics, genomics and bioinformatics approach.

Pre-requisites: HSCI2004 Genetics and Epigenetics

HSCI3004 Genomics and Bioinformatics (or concurrent enrolment)

**HSCI3006 ADVANCED BIOINFORMATICS**

This course provides both theory and practice of commonly used methods in the analysis of bioinformatics data. These methods include analysis of ribose nucleic acid (RNA), deoxyribose nucleic acid (DNA), and protein sequence data, structure and function analysis, statistical methods, and techniques used in detection of disease associated genes and mutation loci. Analysis demos, practical work, and individual projects are conducted in web and UNIX/LINUX environments.

Pre-requisite: HSCI2000 Cell and Molecular Biology

**HSCI3007 BIOMEDICAL MATERIALS**

This course focuses on the science of medical implants, scaffolds and devices that are playing a significant role in the globally aging population. It comprises key concepts in the design and applications of natural and synthetic biomaterials in various forms for bone, dental, skin, vascular, liver, lung and neural tissue regeneration and relevant applications. This course integrates the fundamental pharmaceutical and biomedical sciences with the cutting-edge medical applications in the real world and prepares the students for broad career opportunities across academic, medical and industrial fields.

Pre-requisites: HSCI1000 General Chemistry

HSCI1002 Introduction to Biological Sciences

**HSCI3008 BIOPHARMACEUTICS AND PHARMACOKINETICS**

This course introduces the basic principles of pharmacokinetics involved in the onset, duration and termination of drug action. The essential factors governing drug disposition (absorption, distribution, metabolism and excretion) are elaborated. The mathematical basis on the model fitting process of the concentration-time data and the calculation of main pharmacokinetic parameters is introduced with hands-on practice. Drug-drug interactions-caused safety concerns are addressed in the context of the increasing trend in the prevalence of polypharmacy. Moreover, the metabolic function of gut microbiota and the role in drug disposition are updated. Finally, the relationship between pharmacokinetics and pharmacodynamics is explored to help understand clinical variability to drug response.

Pre-requisites: HSCI1003 General and Clinical Biochemistry

HSCI2006 Physiology and Pathophysiology

HSCI2011 Analytical Chemistry

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### **HSCI3009 CHINESE MEDICINE**

This course focuses on the introduction of the basic theory of Chinese Medicine, and its application in clinic. It is divided into two parts, and in the first part, the essential theories of Chinese Medicine, including philosophical basis, fundamental concepts in Chinese Medicine and diagnostic methods are discussed. In the second part, the clinical applications of Chinese Medicine and scientific basis underlying the efficacy of Chinese Medicine are covered. Chinese Medicine has a systemic and complete theory and long-standing history. It is an exceptional branch of traditional medicine seen throughout the world, and is a treasure of Chinese traditional culture. With its unique and comprehensive theoretical system and remarkable therapeutic effects on different types of diseases and conditions, Chinese Medicine represents a major modality of medical care and prevention of disease by using alone or combined with biomedicine.

Pre-requisite: None

### **HSCI3010 PHARMACEUTICS**

This course introduces the preparation theory, formulation design, production technology, quality evaluation and other contents of pharmaceutical products for clinical applications. It assists the students in understanding the various dosage forms and drug delivery systems, and how medicinal and pharmaceutical substances are incorporated into them. Moreover, the applications of pharmaceutical technology on research and development of the Chinese medicine and healthcare product are introduced.

Pre-requisites: APAC3005 Physical Chemistry  
HSCI2009 Pharmacology

### **HSCI3011 PHARMACEUTICS LAB**

This course provides laboratory practice for the students in pharmaceutical development that helps students understand the knowledge of dosage form design and development, quality evaluation which have learned in Pharmaceutics.

Pre-requisite: HSCI3010 Pharmaceutics (or concurrent enrolment)

### **HSCI3012 PHARMACEUTICAL ANALYSIS**

The course provides a comprehensive introduction to analytical chemistry relevant for chemical quality control of pharmaceutical raw materials and final drug products. It explains the process of experimental results elaboration for determining the appropriateness of the analytical method used in quality control, demonstrates how to use the pharmacopoeia for the analysis of pharmaceutical active ingredients and impurities (identification, quantitative analysis), and familiarizes students with performing various analytical methods in pharmaceutical analysis and quality control.

Pre-requisites: HSCI1005 Organic Chemistry  
HSCI2011 Analytical Chemistry

### **HSCI3013 PHARMACEUTICAL ANALYSIS LAB**

This course focuses on the basic aspects of pharmaceutical dosage forms and pharmaceutical analytical skills. Each laboratory experiment is designed to provide students with hands-on experience in executing elementary analytical skills and quality control tests for various dosage forms, which helps students understand how to perform experiment design and possible troubleshooting. Students can be familiar with the analytical technicalities and experimental design used for the qualitative and quantitative analysis and quality control of various active ingredients and pharmaceutical products.

Pre-requisites: HSCI2011 Analytical Chemistry  
HSCI3012 Pharmaceutical Analysis (or concurrent enrolment)

### **HSCI3014 PHARMACY ADMINISTRATION**

This course introduces the pharmacy management which is an interdisciplinary field of pharmacy and social sciences. The principles and methods of social science are applied on the activities and management of modern pharmacy. In this course, students can understand the basic law of pharmaceutical activities, be familiar with the pharmaceutical management system and

organization, master the basic content and method, master Chinese and international main laws and regulations, have the ability with drug development, manufacture, distribution, use and other aspects of management and supervision. The students apply the theory and knowledge of pharmacy management to guide the practice work.

Pre-requisite: None

### **HSCI3015 PHYTOCHEMISTRY**

This course provides how natural products are normally classified according to their biosynthetic origins and chemical properties. A systematic study of natural products of medicinal and pharmaceutical importance to their identification, isolation, separation techniques are discussed. This course consists of lectures and lab experiments.

Pre-requisite: HSCI1005 Organic Chemistry

### **HSCI3016 EVOLUTIONARY BIOLOGY**

This course introduces the concepts in evolutionary biology, which serve as the foundation to understand biology and medicine, and to test hypotheses in scientific research. All life on Earth shares a last universal common ancestor that lived approximately 3.5 to 3.8 billion years ago, and has been shaped by repeated formations of new species, changes within species and loss of species throughout the evolutionary history of life on Earth. The course provides the opportunity for students to learn the history of life, evolutionary processes, the concepts of microevolution and macroevolution and speciation.

Pre-requisite: HSCI2000 Cell and Molecular Biology

### **HSCI3017 MEDICAL GENETICS**

This course introduces the concept of medical genetics which uses genetics principles for medical care of diagnosis, management, and counselling people with genetic disorders through using genomics, bioinformatics, gene therapy, personalized and predictive medicine. It covers topics in the principle of genetics, the use of genomics data and the controversial concerns of applying medical genetics in real life.

Pre-requisites: HSCI2000 Cell and Molecular Biology  
HSCI2004 Genetics and Epigenetics

### **HSCI4000 GRADUATION PROJECT I**

The final year project is an essential part of the degree. In this course, students work independently on a research project under the supervision of an academic faculty member, culminating in a written research proposal at the end of the first semester. The project supervisor guides the student through the process and provides support and advice on all aspects of the project work.

Pre-requisite: None

### **HSCI4001 CANCER BIOLOGY AND THERAPY**

Cancer has a profound impact on our society and has been the driving force behind major research advances in medical sciences. This course provides a comprehensive overview of the biology, pathology and treatment of cancer. Specific topics covered include an overview of the field, molecular and genetic basis of cancer, cancer pathology, carcinogens, and current cancer therapies.

Pre-requisites: HSCI2000 Cell and Molecular Biology  
HSCI2004 Genetics and Epigenetics

### **HSCI4002 STEM CELL BIOLOGY AND REGENERATIVE MEDICINE**

This course covers a broad range of topics relevant to stem cell biology. This fast-moving field brings together many aspects of basic and applied biology and medicine, including development, regeneration/repair, and cancer. The course covers the following concepts and themes: pluripotency and reprogramming, pluripotent cell types, organ systems, stem cells and cancer, therapeutics and ethics. The lecture/discussion format gives students both a broad background and the opportunity to apply critical thinking skills to recent data in the field.

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Pre-requisite: None

#### **HSCI4004 DRUG DISCOVERY AND DEVELOPMENT**

This course aims to provide students with an overview of the drug discovery and development process from the identification of novel drug targets to the introduction of new drugs into clinical practice. Topics covered include approaches to new drug discovery, drug design and synthesis, pharmacodynamics, pharmacokinetics, drug interaction, drug transportation, prodrug design and application, the drug development process, and drug design case studies.

Pre-requisites: HSCI1003 General and Clinical Biochemistry  
HSCI4003 Pharmacology and Chemical Biology (or concurrent enrolment)

#### **HSCI4005 GRADUATION PROJECT II**

The final year project is an essential part of the degree. In this course, students work independently on a research project under the supervision of an academic faculty member, culminating in a final project report and an oral presentation at the end of the second semester. The project supervisor guides the student through the process and provides support and advice on all aspects of the project work.

Pre-requisite: HSCI4000 Graduation Project I

#### **HSCI4006 PUBLIC HEALTH**

This course intends to survey the broad field of public health and serves as an introduction to the major issues of health and health care in general as well as in local community. The course defines and describes public health issues, and identifies potential problems and their solutions.

Pre-requisite: None

#### **HSCI4007 TRANSLATIONAL MEDICINE**

The aim of translational medicine is to translate knowledge, mechanisms and techniques discovered by basic scientific research into new approaches for diagnosis and treatment of diseases. This course focuses on the principles and practices of translational medicine as they apply to the development of a new drug (small molecules and/or biologics), device, or diagnostic. Topics covered include a historical perspective of translational medicine, emerging concepts in biomarker discovery, innovative drug development, cell therapies, translational bioinformatics, IRB & ethical considerations in human subject research, and human clinical trials.

Pre-requisite: HSCI2000 Cell and Molecular Biology

#### **HSCI4009 TOXICOLOGY**

The course covers basic concepts, knowledge and methods in toxicology, including the disposition of toxic substances by the body, how toxic substances react with biomolecules and lead to target organ toxicity / non-organ directed toxicity, knowledge about toxic substances, as well as applications of toxicology including environmental, occupational, regulatory, food toxicology, and natural toxins.

Pre-requisite: None

#### **HSCI4010 PHARMACEUTICAL ECONOMICS AND POLICY**

This course aims to study pharmaceutical industry based on industry economics and health policy theory. The pharmaceutical industry and policy are presented and analyzed by combining industry evolution and global view in this course. Key management topics of pharma, including strategic management (business model), R&D (pharmaceutical innovation), and marketing, etc., are introduced. Pharmacoeconomic evaluation of drugs are also studied in this course. Related academic work in the leading journals are studied and discussed in this course to improve students' understanding the frontier researches in pharmaceutical economics and policy.

Pre-requisite: None

#### **HSCI4011 PHARMACOINFORMATICS**

This course introduces computationally algorithmic methods in collection, transformation, storage, organization, distribution, retrieval, visualization, and analysis of pharmaceutical and healthcare



information. It provides a unique opportunity for students to learn essential computational chemistry, bioinformatics, artificial intelligence, physiologically-based pharmacokinetic modelling and simulation, computer science and their applications in pharmacy and medicine.

Pre-requisites: HSCI1000 General Chemistry  
HSCI1002 Introduction to Biological Sciences

**HSCI4012 BIOINFORMATCS IN ACTION**

This course introduces the applications in bioinformatics and computational biology, covering the analyses of genomics, transcriptome, epigenome and multi-omics. It provides exposure and training in data analysis of bioinformatics and computational biology.

Pre-requisites: CISC1004 Introduction to Computer Science  
HSCI3003 Biostatistics and Experimental Design