(Subject to the University's approval)

M.80/1125 (Amended)

REGULATIONS FOR THE DEGREE OF MASTER OF MEDICAL SCIENCES (MMedSc)

These regulations apply to candidates admitted to the Master of Medical Sciences in the academic year 2026-27 and thereafter.

(*See also General Regulations and Regulations for Taught Postgraduate Curricula*)

MMS.1 Admission requirements

To be eligible for admission to the curriculum leading to the degree of Master of Medical Sciences, a candidate shall:

(a) comply with the General Regulations;
(b) comply with the Regulations for Taught Postgraduate Curricula;
(c) hold a Bachelor's degree with honours of this University or a qualification of equivalent standard from this University or from another comparable institution accepted for this purpose;
(d) satisfy the examiners in a qualifying examination if required; and
(e) for a candidate who is seeking admission on the basis of a qualification from a university or comparable institution outside of Hong Kong of which the language of teaching and/or examination is not English, shall satisfy the University English language requirement applicable to higher degrees as prescribed under General Regulation G2(b).

MMS.2 Qualifying examination

(a) A qualifying examination may be set to test the candidate's formal academic ability or his/her ability to follow the courses of study prescribed. It shall consist of one or more written papers or their equivalent and may include a project report; and
(b) A candidate who is required to satisfy the examiners in a qualifying examination shall not be permitted to register until he/she has satisfied the examiners in the examination.

MMS.3 Advanced Standing

Advanced Standing of up to 12 credits may be granted to a candidate who has successfully completed equivalent course(s) no more than 5 years before admission to the curriculum, subject to the approval by the Faculty Board. Candidates seeking Advanced Standing should submit a written application to the Programme Office before commencement of the study.

MMS.4 Award of degree

To be eligible for the award of the degree of Master of Medical Sciences a candidate shall

(a) comply with the General Regulations;
(b) comply with the Regulations for Taught Postgraduate Curricula; and
(c) complete the curriculum and satisfy the examiners in accordance with the regulations set out below.

MMS.5 Period of study

The curriculum shall normally extend over one academic year of full-time study or two academic years of part-time study. Candidates shall not be permitted to extend their study beyond the maximum period of registration of two academic years of their full-time study or four academic years of their part-time study.

MMS.6 Completion of curriculum

To complete the curriculum, a candidate shall

(a) satisfy the requirements prescribed in TPG6 of the Regulations for Taught Postgraduate Curricula;

(b) take no less than 69 credits in the manner specified in these regulations and the syllabus, and follow the instructions in the syllabus prescribed for the Courses and complete satisfactorily all required written, practical and/or clinical work;

(c) satisfy the examiners in the Courses by continuous assessments and/or by written examinations; and

(d) complete and present a satisfactory capstone report on an approved topic.

Candidates who fail to fulfil the requirements within the prescribed maximum period of registration shall be recommended for discontinuation under the provision of General Regulation G12. No extension beyond the maximum period of registration shall be permitted except in the most exceptional circumstances and with the prior approval of the University.

MMS.7 Capstone report

The title of the capstone report shall be submitted for approval in the year of graduation. The candidate shall submit a statement that the capstone report represents his/her own work (or in the case of conjoint work, a statement countersigned by his/her co-worker, which shows his/her share of the work) undertaken after registration as a candidate for the degree. The examiners may also prescribe an oral or a written examination on the subject of the capstone report.

MMS.8 Assessment

(a) A candidate who has failed to satisfy the examiners in a Course in the first attempt may be permitted:
  (i) to attend a re-examination; or
  (ii) to re-submit the failed coursework(s) without having to re-take the same Course; or
  (iii) to re-take the Course and the prescribed written, practical and/or clinical work; or
  (iv) to enrol in another Course in lieu if the failed course is not a compulsory course.

(b) A candidate who has presented an unsatisfactory capstone report in the first attempt may be permitted to revise the capstone report and to re-present it within a specified period of not more than four months after receipt of a notice that it is unsatisfactory.

MMS.9 Discontinuation of studies

A candidate

(a) who has failed to satisfy the examiners in a second attempt in any Course(s), capstone report; or

(b) who has exceeded the prescribed maximum period of registration

shall be recommended for discontinuation of studies under the provisions of General Regulation G12.

MMS.10 Grading system

Individual Courses (i.e. Core Course, Specialised Course and Capstone Course) shall be graded according to the grading system of "Pass" or "Fail".

MMS.11 Classification of awards

Candidates who have shown exceptional merit in all examinations may be awarded a mark of distinction which shall be recorded in the candidates' transcript.

MMS.12 Publication based on work approved

Any publication based on work approved for a higher degree should contain a reference to the effect that the work was submitted to the University of Hong Kong for the award of the degree.

(Subject to the University's approval)

M.81/1125 (Amended)

SYLLABUS FOR THE DEGREE OF MASTER OF MEDICAL SCIENCES (MMedSc)

These syllabuses apply to candidates admitted to the Master of Medical Sciences in the academic year 2026-27 and thereafter.

CURRICULUM STRUCTURE

Candidates are required to complete a 69-credit curriculum as set out below:

Curriculum Structure	Credit Weight
Taught Courses	**42**
Core Courses (6 credits each)	12 - 24
Specialised Courses (3 or 6 credits each)	18 - 30
Capstone Experience	**27**
Total credits	**69**

TRACKS AND SPECIALISATIONS

Candidates are required to choose one of the following Specialisations (1 – 7), which are grouped under two Tracks (I, II):

Track	Specialisation
[I] Clinical Investigation	[1] Advanced Musculoskeletal Research and Practice
	[2] Clinical and Molecular Pathology, Haematopathology, and Immunology
	[3] Clinical Physics in Radiation Oncology and Medical Imaging
	[4] Metabolic Medicine
	[5] Pharmaceutical Science and Applications in Health Care
[II] Genomics and Precision Medicine	[6] Genetic Counselling
	[7] Genomics and Bioinformatics

The Specialisations are offered subject to availability and minimum student number.

CURRICULUM REQUIREMENTS

A. Core Courses

Candidates are required to complete **24 credits** of courses from the following list unless otherwise specified for their chosen Specialisation:

Course Code	Course Name	Credits
MSPH7901	Introduction to Biostatistics	6
MSPH7902	Introduction to Epidemiology	6
MEDI7901	Cell Metabolism	6
PAED7901	Principles to Genetic Counselling	6
PAED7902	Introduction to Genomic Medicine and Precision Health	6
PATH7901	Laboratory Methods and Instrumentation	6
PATH7902	General Cytopathology	6
PATH7903	Practical Course in Laboratory Methods	6
PATH7904	Fundamentals of Common Human Diseases	6
PATH7905	Recent Advances in Cancer Biology	6
PHAR7901	Principles of Drug Action	6
PHAR7902	Clinical Trials Management and Pharmacovigilance	6
MSBS7901	Molecular Biology of the Gene and Diseases	6
MSBS7902	Advanced Cell Biology	6
MSBS7903	Integrative Perspectives of Body Functions	6
SURG7901	Human Genomics in Healthcare and Society	6

For Specialisation [4] *Metabolic Medicine*:

Candidates are required to complete **24 credits** of courses, including **6 credits** of course from the following list AND **18 credits** of courses from the Core Course list:

Course Code	Course Name	Credits
MEDI7901	Cell Metabolism	6

For Specialisation [5] *Pharmaceutical Science and Applications in Health Care*:

Candidates are required to complete **24 credits** of courses, including **6 credits** of course from the following list AND **18 credits** of courses from the Core Course list:

Course Code	Course Name	Credits
PHAR7901	Principles of Drug Action	6

For Specialisation [6] *Genetic Counselling*:

Candidates are required to complete **24 credits** of courses, including **12 credits** of courses from the following list AND **12 credits** of courses from the Core Course list:

Course Code	Course Name	Credits
PAED7901	Principles to Genetic Counselling	6
SURG7901	Human Genomics in Healthcare and Society	6

For Specialisation [7] *Genomics and Bioinformatics*:

Candidates are required to complete **18 credits** of courses, including **6 credits** of course from the following list:

Course Code	Course Name	Credits
PAED7902	Introduction to Genomic Medicine and Precision Health	6

AND **12 credits** of courses from the following list:

Course Code	Course Name	Credits
MSPH7901	Introduction to Biostatistics	6
MSPH7902	Introduction to Epidemiology	6
PAED7901	Principles to Genetic Counselling	6
PATH7904	Fundamentals of Common Human Diseases	6
PATH7905	Recent Advances in Cancer Biology	6
MSBS7901	Molecular Biology of the Gene and Diseases	6

B. Specialised Courses

For Specialisation [1] *Advanced Musculoskeletal Research and Practice*:

Candidates are required to complete **18 credits** of courses from one of the following blocks (either A, B, C, D, E or F):

Course Code	Course Name	Credits
Block A: Spine Surgery		
OSUR7101	Spine Surgery: Biomechanics and Assessment of Patients	6
OSUR7102	Spine Surgery: Intraoperative Spinal Cord Monitoring	6
OSUR7103	Spine Surgery: Laboratory Techniques	6
Block B: Joint Replacement Surgery		
OSUR7104	Joint Replacement Surgery: Applied Anatomy, Biomechanics and Biomaterials	6
OSUR7105	Joint Replacement Surgery: Operative Surgery	6
OSUR7106	Joint Replacement Surgery: Outcome Measurement	6
Block C: Advanced Musculoskeletal Imaging		
OSUR7107	Advanced Musculoskeletal Imaging: Anatomic and Kinesiological Examination of the Spine	6
OSUR7108	Advanced Musculoskeletal Imaging: Micro-CT and Paraspinal Muscle Imaging	6
OSUR7109	Advanced Musculoskeletal Imaging: Spinal Cord	6
Block D: Orthopaedic Trauma Surgery		
OSUR7110	Orthopaedic Trauma Surgery: Fracture Healing and Biomechanics of Fixation Devices	6
OSUR7111	Orthopaedic Trauma Surgery: Operative Surgery	6
OSUR7112	Orthopaedic Trauma Surgery: Outcome Assessment	6
Block E: Orthopaedic Rehabilitation		
OSUR7113	Orthopaedic Rehabilitation: General Principles	6
OSUR7114	Orthopaedic Rehabilitation: Rehabilitation of Spinal Cord Injury	6

OSUR7115	Orthopaedic Rehabilitation: Application of Electrodiagnosis and Ultrasound in Orthopaedic Practice	6
Block F: AI and Orthopaedic Bioengineering		
OSUR7116	AI and Orthopaedic Bioengineering: Fundamental Principles	6
OSUR7117	AI and Orthopaedic Bioengineering: Applications of Orthopaedic Bioengineering	6
OSUR7118	AI and Orthopaedic Bioengineering: AI-assisted Diagnostics and Treatment in Orthopaedic Practice	6

For Specialisation [2] ***Clinical and Molecular Pathology, Haematopathology, and Immunology*:**

Candidates are required to complete **18 credits** of courses from the following list:

Course Code	Course Name	Credits
PATH7102	Current Topics and Techniques in Immunology	3
PATH7103	Molecular and Clinical Laboratory Immunology Methods and Applications	3
PATH7104	Molecular Genetics and Cytogenetics of Cancer	6
PATH7105	Techniques and Applications of Molecular Pathology	6

For Specialisation [3] ***Clinical Physics in Radiation Oncology and Medical Imaging*:**

Candidates are required to complete **18 credits** of courses, including **3 credits** of courses from the following list:

Course Code	Course Name	Credits
DRAD7103	Health Physics with Focuses on Radiological Protection in Medical Sectors	3

AND **15 credits** of courses from the following list:

Course Code	Course Name	Credits
DRAD7101	Advance Radiological Physics and Radiation Dosimetry	3
DRAD7102	Brachytherapy Physics	3
DRAD7104	Magnetic Resonance Imaging – Principles and Its Applications	3
DRAD7105	Molecular Imaging and Medical Cyclotron	3
DRAD7106	Nuclear Medicine Sciences	3
DRAD7107	Physics in Medical Imaging	3
DRAD7108	Principles and Practice of Radiotherapy Physics	3
DRAD7109	Quality Assurance (QA) in Radiation Therapy and Medical Imaging	3
DRAD7110	Cardiac Computed Tomography and Cardiac Magnetic Resonance Imaging	3
DRAD7111	AI in Radiology and Medical Imaging	3
DRAD7112	Medical Image Processing and Analysis	3
DRAD7113	Numerical Modeling Methods for Imaging and Treatment Systems	3
DRAD7114	Neuroimaging	3

For Specialisation [4] *Metabolic Medicine*:

Candidates are required to complete **18 credits** of courses from the following list:

Course Code	Course Name	Credits
MEDI7101	Current Therapeutic Strategies for Metabolic Diseases	6
MEDI7102	Current Topics in Energy Balance and Obesity	6
MEDI7103	Recent Advances in Metabolic Disorders	6

For Specialisation [5] *Pharmaceutical Science and Applications in Health Care*:

Candidates are required to complete **18 credits** of courses from the following list:

Course Code	Course Name	Credits
PHAR7101	Advanced Drug Delivery and Drug Development	6
PHAR7102	Evidence-Based Practice	3
PHAR7103	Health Informatics and Big Data	3
PHAR7104	Therapeutic Antibodies	3
PHAR7105	Introduction to Pharmaceutical Industry	3
PHAR7106	Advanced Therapy Products	3

For Specialisation [6] *Genetic Counselling*:

Candidates are required to complete **18 credits** of courses from the following list:

Course Code	Course Name	Credits
SURG7101	Risk Calculation and Effective Communication in Genetic Counselling	3
SURG7102	Advancements in Genomics	3
SURG7103	Genetics in Medicine 1 (Prenatal)	3
SURG7104	Genetics in Medicine 2 (Paediatrics)	3
SURG7105	Genetics in Medicine 3 (Cancer)	3
SURG7106	Clinical Scenarios Workshop (+/- Clinical Attachment)	3

For Specialisation [7] *Genomics and Bioinformatics*:

Candidates are required to complete **24 credits** of courses from the following list:

Course Code	Course Name	Credits
MSBS7101	Essential Skills in High-throughput Sequencing Data Analysis	6
MSBS7102	Foundations in Biomedical Data Science	6
PAED7101	Molecular Diagnosis of Mendelian Diseases by NGS Technology	3
PAED7102	Genetic Studies of Complex Diseases	3

PAED7103	Cancer Genomics and Precision Treatment	3
PAED7104	Scientific Methods, Experimental Design, and Data Interpretation in Genetics and Genomics	3

C. Capstone Experience

Candidates are required to complete **27 credits** of Capstone Course for the chosen Specialisation:

Course Code	Course Name	Credits
DRAD7000	Capstone: Clinical Physics in Radiation Oncology and Medical Imaging	27
MEDI7000	Capstone: Metabolic Medicine	27
OSUR7000	Capstone: Advanced Musculoskeletal Research and Practice	27
PAED7000	Capstone: Genomics and Bioinformatics	27
PATH7000	Capstone: Clinical and Molecular Pathology, Haematopathology, and Immunology	27
PHAR7000	Capstone: Pharmaceutical Science and Applications in Health Care	27
SURG7000	Capstone: Genetic Counselling	27

AND **two** non-credit bearing courses from the following list:

Course Code	Course Name	Credits
MMSC6001	Academic Writing	N/A
MMSC6003	Research Ethics	N/A

The capstone experience allows candidates to integrate and apply the knowledge and skills that they acquired in the programme and showcase their competency in the chosen Specialisation. To fulfil the capstone experience requirement, candidates are required to (i) complete the 27-credit Capstone Course for their chosen Specialisation; (ii) attend the workshop "MMSC6001 Academic Writing"; and (iii) complete "MMSC6003 Research Ethics", a web-based learning course on Epigeum Research Integrity Programme developed by Oxford University Press and pass the course(s) selected.

COURSE LIST

The courses are offered subject to availability and minimum student number.

Courses marked with an asterisk "*" are offered by other taught postgraduate curricula in the LKS Faculty of Medicine.

Core Course List

Course Code	Course Name	Credits
MSPH7901	Introduction to Biostatistics*	6
MSPH7902	Introduction to Epidemiology*	6
MEDI7901	Cell Metabolism	6
PAED7901	Principles to Genetic Counselling	6
PAED7902	Introduction to Genomic Medicine and Precision Health	6
PATH7901	Laboratory Methods and Instrumentation	6
PATH7902	General Cytopathology	6
PATH7903	Practical Course in Laboratory Methods	6
PATH7904	Fundamentals of Common Human Diseases	6
PATH7905	Recent Advances in Cancer Biology	6
PHAR7901	Principles of Drug Action*	6
PHAR7902	Clinical Trials Management and Pharmacovigilance*	6
MSBS7901	Molecular Biology of the Gene and Diseases	6
MSBS7902	Advanced Cell Biology	6
MSBS7903	Integrative Perspectives of Body Functions	6
SURG7901	Human Genomics in Healthcare and Society	6

MSPH7901 Introduction to Biostatistics (6 credits)*

This course introduces students to biostatistical methods and the underlying principles, as well as practical guidelines of "how to do it" and "how to interpret it" as the role they can play in public health decision-making. The course covers descriptive and inferential statistical techniques, with emphasis on the selection of appropriate methods and tools for various applications and the proper interpretation of results. Students will be introduced to SPSS, a commonly used software package for statistical analyses.

The following topics will be covered:

- Exploratory data analysis
- Regression and correlation
- Probability
- Statistical inference
- Hypothesis tests
- Designing studies
- Applied regression
- Analysis of survival data
- Statistics in practice

MSPH7902 Introduction to Epidemiology (6 credits)*

The course is designed to equip students with the skills to identify, define and calculate measures of illness and their association with health determinants, including risks, rates and prevalence; describe and differentiate common epidemiological study designs, and discuss their strengths and limitations; and discuss approaches to the identification of causes of illness and the implications for control efforts.

The following topics will be covered:

- Approaches to measuring the occurrence and distribution of illness in populations
  - Measures of occurrence
  - Measures of effect and association
- Design, interpretation and critical appraisal of epidemiologic studies
  - Randomized trials
  - Cohort studies
  - Case-referent studies
  - Other types of study designs
  - Directed acyclic graphs (DAGs) and causal inference
  - Bias, confounding and interaction
- Epidemiology in practice
  - Conducting and reporting epidemiological studies
  - Using appropriate epidemiological evidence in public health practice and medical research

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MEDI7901 Cell Metabolism (6 credits)

This course introduces the key catabolic and anabolic pathways in cellular metabolism and provides insights into the latest concepts of metabolic regulation and integration in mammals.

PAED7901 Principles to Genetic Counselling (6 credits)

This course aims to provide a comprehensive understanding of human genetics and genetic disorders, and an overview of the roles and responsibilities of a genetic counsellor in genetic assessment and result disclosure. The course also discusses the ethical, legal, and policy issues associated with genetic testing and genomic development. Students will also learn basic clinical skills for conducting interviews, presenting relevant genetic information to patients and families, and facilitating informed decision-making.

The following topics will be covered:

- Introduction to human genetics and inheritance Cellular machinery for energy metabolism
- Genetic assessment and informed consent
- Result disclosure and counselling theories
- Genetic testing and genomic technology
- Ethics, law and policy in genetics
- Case discussion and role play on the above topics

PAED7902 Introduction to Genomic Medicine and Precision Health (6 credits)

This course is designed to provide students with a comprehensive understanding of how DNA sequencing technology, omics approaches, and artificial intelligence are revolutionising the field of

medicine and healthcare. We will delve into the impact of these technologies on disease diagnosis, risk prediction, prevention, treatment, and healthcare delivery.

The following topics will be covered:

- Introduction of precision medicine and the future of healthcare delivery
- Molecular Diagnosis of Mendelian diseases and population screening
- Polygenic scores for individual risk prediction for common complex diseases
- Pharmacogenomics
- Omics approaches for targeted cancer treatment
- Metagenomics in diagnosis of infectious diseases
- AI in healthcare research and delivery

PATH7901 Laboratory Methods and Instrumentation (6 credits)

This course aims to provide students with a basic understanding of the principles and latest developments in the practical applications of a broad range of techniques commonly employed in medical research projects.

The following topics will be covered:

- Animal models for research
- Basic concepts in automated DNA sequencing and genotyping
- Basic concepts in conventional and molecular cytogenetics
- Cancer stem cells: methods and protocols
- Epigenetics and methylation analysis
- Mass spectrometry and its applications in biological studies
- Mutation detection technologies
- Principle and applications of flow cytometry
- Protein analysis methods
- Tissue processing and immunohistochemistry

PATH7902 General Cytopathology (6 credits)

This course aims to equip students to meet the increased demand on the service of clinical cytology in Hong Kong.

The following topics will be covered:

- Clinical relevance of cytology consultation reports: implications on management
- Collection of cell samples and laboratory processing of cytology specimens
- Ethical and legal aspects of clinical cytopathology
- How to diagnose malignancy in gynaecological cytology specimens
- How to diagnose malignancy in non-gynaecological exfoliated cytology and fine needle aspiration specimens
- Organisation of a cytopathology laboratory
- Practical workshop on fine needle aspiration cytopathology
- Practical workshop on gynaecological cytopathology
- Practical workshop on non-gynaecological exfoliated cytopathology
- Quality assurance programme and laboratory accreditation
- Recent advances in cytopathology

PATH7903 Practical Course in Laboratory Methods (6 credits)

(Prerequisite: PATH7901 Laboratory Methods and Instrumentation)

This course offers practical experience in laboratory methods frequently used in medical research projects, and provides training in experimental design and biological sample processing. Students will also develop observational and record-keeping skills critical for successful research work.

The following topics will be covered:

- Tissue processing and immunohistochemistry:
  - Tissue embedding
  - Microtome sectioning of paraffin block and cryostat sectioning of frozen block
  - H&E staining, immunohistochemistry (IHC)
  - Histological analysis
- Tissue culture:
  - Basic tissue culture techniques (Seed and freeze cells)
  - Cell growth assays (Tryphan blue staining, cell counting)
  - Flow cytometric analysis
- Preparation of samples for molecular diagnosis:
  - Extraction methods for genomic DNA and RNA
  - Extraction methods for protein
  - Quantification of isolated DNA, RNA and protein
  - Electrophoresis (agarose gel, SDS-PAGE)
- Molecular detection of gene expression and mutation:
  - Reverse transcription of mRNA
  - PCR / quantitative PCR
  - DNA sequencing

PATH7904 Fundamentals of Common Human Diseases (6 credits)
(The prospective students who enrol in this course should not have a Medical or Dental background)

This course covers the essential clinical, pathological, epidemiological, and pathophysiology features of common diseases in Hong Kong involving major body systems including cardiovascular, respiratory, reproductive, urinary, central nervous system, musculoskeletal, hepatobiliary, gastrointestinal, haematolymphoid, and endocrine systems. The importance of laboratory medicine in clinical practice will be demonstrated by a series of lectures, and where appropriate, supplemented by case presentations. Upon completion of the course, science students will be geared with greater understanding of the different role of pathology, and the knowledge will be beneficial to current and future research activities.

The following topics will be covered:

- Introduction to pathology and immunology
- Global burden of disease
- Common cancers in Hong Kong with focus on early detection and precision treatment
- Cardiovascular diseases
- Gastrointestinal tract
- Osteoporosis
- Respiratory tract diseases
- Diseases of reproductive organs
- Breast diseases
- Vascular central nervous system diseases and dementia
- Urinary tract diseases
- Anaemia - What, Why and How?
- Toxicology in clinical practice
- Thyroid goires

PATH7905 Recent Advances in Cancer Biology (6 credits)

This course aims to introduce emerging concepts in cancer biology and cutting-edge topics in cancer research.

The following topics will be covered:

- Genetic aspects of cancer heterogeneity
- Cancer metastasis
- Cancer epigenetics
- RNA splicing in cancer
- Cancer stem cells
- Cancer metabolism
- Tumor microenvironment and cancer immunology
- Cell-cycle checkpoints and cancer
- Cancer genomics
- Surgical pathology in management and prognostication of common human cancers

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PHAR7901 Principles of Drug Action (6 credits)*

The course provides general and broad knowledge about drug distribution and how drugs exert therapeutic effects in the human body. Students will learn basic concepts of pharmacokinetics, drug receptor interactions and mechanisms of responses to drugs. The course will also discuss aspects of drug use that are relevant to clinical practice, such as drug hypersensitivity, adverse drug reactions and drug interactions.

PHAR7902 Clinical Trials Management and Pharmacovigilance (6 credits)*

This course covers a comprehensive range of topics related to clinical trials, including compliance, preparation and process. Lessons are delivered by study site management professionals with hands-on experience in clinical trials management and operations. Students will establish a strong foundation in drug safety and pharmacovigilance principles, which will prepare them for future work in different capacities such as regulatory affairs, quality assurance and medical affairs. Strategies to manage recalls will be discussed. Students will be equipped with up-to-date knowledge on drug safety to address stringent requirements and regulations in both local and international context.

MSBS7901 Molecular Biology of the Gene and Diseases (6 credits)

This course delves into the intricate molecular mechanisms underlying genetic diseases and their implications for human health. Students will explore cutting-edge research on gene function, epigenetic regulation, protein structure, dysfunction, and disease, providing a comprehensive understanding of molecular biology in the context of various disorders. Through in-depth analysis of genetic mutations, cancer biology, neurodegenerative processes, and regenerative medicine, students will gain insight into potential therapeutic strategies and advancements in the field.

The following topics will be covered:

- Complex genetic diseases
- Reverse genetics and cloning of human disease genes: the cystic fibrosis gene
- Epigenetic regulation by histone modifications

- Gene function analysis: model organism and transgenic animals
- Introduction to protein structure and function
- Protein dysfunction and disease
- Targeting gene mutations by activity-based compounds for cancer therapy
- Genetic mutations and cancer
- MicroRNA biogenesis and RNA therapeutics
- Molecular mechanisms of ageing
- Protein misfolding, amyloid formation and neurodegeneration
- Stem cell and regenerative medicine

MSBS7902 Advanced Cell Biology (6 credits)

This course is a dynamic course that that explores advanced topics in cellular biology, providing students with a comprehensive understanding of cutting-edge research and technologies in the field. The course content encompasses a range of topics such as epigenetics, cell signalling, autophagy, model systems for research, RNA biology, metabolic processes, immune cell communication, bioengineering, structural biology, glial cell biology, and stem cell biology applications. The course is designed to be adaptable to incorporate the latest developments and emerging trends in cellular biology, ensuring that students are equipped with the most up-to-date knowledge and skills in this rapidly evolving field.

The following topics will be covered:

- Epigenetics cell signalling
- Autophagy
- Tumour and Drosophila models
- RNA biology and RNA-targeting CRISPR-Cas systems
- Cell metabolism (bioenergetics and thermodynamics)
- Glycolysis, gluconeogenesis and PPP
- How to decode immune cell language
- Engineering life
- Structural biology
- Glial cell biology
- Stem cell biology and application

MSBS7903 Integrative Perspectives of Body Functions (6 credits)

This course aims to equip students with current knowledge on the mechanisms of human body functions from an integrative perspective. This course provides students with an in-depth exploration of the complex mechanisms governing human body functions. This course offers a comprehensive understanding of various physiological systems and their integrative roles in maintaining overall health and well-being. Students will delve into neuroscience, appetite and body weight regulation, respiratory physiology, cardiovascular physiology, immunology, and muscle physiology. These topics will enhance students' knowledge of the underlying factors contributing to various health conditions and diseases. Furthermore, the course will cover stem cell biology, shedding light on how latest stem cell research development can help to address different disorders. In addition to physiological aspects, students will explore cognition and behavior, as well as psychiatric disorders. These topics will provide insight into the complex relationship between neurological processes and cognitive functions, and mental health. By the end of this course, students will not only be equipped with current knowledge in the field but will also be adept at applying state-of-the-art research approaches to the study of human body functions in various contexts.

The following topics will be covered:

- Homeostatic regulation of body functions
- Neuroscience and current research
- Respiratory and cardiovascular system
- Endocrine system and energy homeostasis
- Immunology and current research
- Motor control: skeletal muscle physiology, movement, coordination, and neuromuscular disorders
- Neuropsychological functions: cognition, behaviour and emotion
- Stem cell research & disease treatment

SURG7901 Human Genomics in Healthcare and Society (6 credits)

This course provides an overview of the various clinical applications of human genomics since the Human Genome Project and their impact on our society.

Specialised Course List

Course Code	Course Name	Credits
DRAD7101	Advance Radiological Physics and Radiation Dosimetry	3
DRAD7102	Brachytherapy Physics	3
DRAD7103	Health Physics with Focuses on Radiological Protection in Medical Sectors	3
DRAD7104	Magnetic Resonance Imaging – Principles and Its Applications	3
DRAD7105	Molecular Imaging and Medical Cyclotron	3
DRAD7106	Nuclear Medicine Sciences	3
DRAD7107	Physics in Medical Imaging	3
DRAD7108	Principles and Practice of Radiotherapy Physics	3
DRAD7109	Quality Assurance (QA) in Radiation Therapy and Medical Imaging	3
DRAD7110	Cardiac Computed Tomography and Cardiac Magnetic Resonance Imaging	3
DRAD7111	AI in Radiology and Medical Imaging	3
DRAD7112	Medical Image Processing and Analysis	3
DRAD7113	Numerical Modeling Methods for Imaging and Treatment Systems	3
DRAD7114	Neuroimaging	3
MEDI7101	Current Therapeutic Strategies for Metabolic Diseases	6
MEDI7102	Current Topics in Energy Balance and Obesity	6
MEDI7103	Recent Advances in Metabolic Disorders	6
OSUR7101	Spine Surgery: Biomechanics and Assessment of Patients	6
OSUR7102	Spine Surgery: Intraoperative Spinal Cord Monitoring	6
OSUR7103	Spine Surgery: Laboratory Techniques	6
OSUR7104	Joint Replacement Surgery: Applied Anatomy, Biomechanics and Biomaterials	6
OSUR7105	Joint Replacement Surgery: Operative Surgery	6
OSUR7106	Joint Replacement Surgery: Outcome Measurement	6
OSUR7107	Advanced Musculoskeletal Imaging: Anatomic and Kinesiological Examination of the Spine	6

OSUR7108	Advanced Musculoskeletal Imaging: Micro-CT and Paraspinal Muscle Imaging	6
OSUR7109	Advanced Musculoskeletal Imaging: Spinal Cord	6
OSUR7110	Orthopaedic Trauma Surgery: Fracture Healing and Biomechanics of Fixation Devices	6
OSUR7111	Orthopaedic Trauma Surgery: Operative Surgery	6
OSUR7112	Orthopaedic Trauma Surgery: Outcome Assessment	6
OSUR7113	Orthopaedic Rehabilitation: General Principles	6
OSUR7114	Orthopaedic Rehabilitation: Rehabilitation of Spinal Cord Injury	6
OSUR7115	Orthopaedic Rehabilitation: Application of Electrodiagnosis and Ultrasound in Orthopaedic Practice	6
OSUR7116	AI and Orthopaedic Bioengineering: Fundamental Principles	6
OSUR7117	AI and Orthopaedic Bioengineering: Applications of Orthopaedic Bioengineering	6
OSUR7118	AI and Orthopaedic Bioengineering: AI-assisted Diagnostics and Treatment in Orthopaedic Practice	6
PAED7101	Molecular Diagnosis of Mendelian Diseases by NGS Technology	3
PAED7102	Genetic Studies of Complex Diseases	3
PAED7103	Cancer Genomics and Precision Treatment	3
PAED7104	Scientific Methods, Experimental Design, and Data Interpretation in Genetics and Genomics	3
PATH7102	Current Topics and Techniques in Immunology	3
PATH7103	Molecular and Clinical Laboratory Immunology Methods and Applications	3
PATH7104	Molecular Genetics and Cytogenetics of Cancer	6
PATH7105	Techniques and Applications of Molecular Pathology	6
PHAR7101	Advanced Drug Delivery and Drug Development*	6
PHAR7102	Evidence-Based Practice*	3
PHAR7103	Health Informatics and Big Data*	3
PHAR7104	Therapeutic Antibodies*	3
PHAR7105	Introduction to Pharmaceutical Industry*	3
PHAR7106	Advanced Therapy Products*	3
MSBS7101	Essential Skills in High-throughput Sequencing Data Analysis*	6
MSBS7102	Foundations in Biomedical Data Science*	6
SURG7101	Risk Calculation and Effective Communication in Genetic Counselling	3
SURG7102	Advancements in Genomics	3
SURG7103	Genetics in Medicine 1 (Prenatal)	3
SURG7104	Genetics in Medicine 2 (Paediatrics)	3
SURG7105	Genetics in Medicine 3 (Cancer)	3
SURG7106	Clinical Scenarios Workshop (+/- Clinical Attachment)	3

DRAD7101 Advance Radiological Physics and Radiation Dosimetry (3 credits)

This course aims to equip students with advanced knowledge in radiological physics and radiation dosimetry.

The following topics will be covered:

- Atomic and nuclear structure
- Radioactivity & radioactive decay
- Photon interaction with matter
- Charged particles interaction with matter
- Production and beam quality of X-Ray
- Neutron interaction with matter
- Radiation quantities & units
- Cavity theory and radiation dosimetry
- Absolute dosimetry & techniques
- Relative dosimetry & techniques
- Calibration of photon /electron beams

DRAD7102 Brachytherapy Physics (3 credits)

This course aims to provide students with a comprehensive understanding of the fundamental and practical aspects of brachytherapy. The course includes practical sessions on calibration of HDR sources, treatment planning of HDR clinical cases, and QA in brachytherapy.

The following topics will be covered:

- Radionuclides for treatment
- Source specifications and dosimetry
- Radiation Protection in Brachytherapy
- Quality assurance in Brachytherapy
- Treatment planning in LDR brachytherapy
- Dose distribution around sealed sources
- Dose distribution of radioisotopes
- Treatment planning in HDR brachytherapy

DRAD7103 Health Physics with Focuses on Radiological Protection in Medical Sectors (3 credits)

This course provides an in-depth understanding of the principles and practices of radiation protection in healthcare settings, with practical sessions designed to provide hands-on experience.

The following topics will be covered:

- Introduction and historical perspective
- Basic Principles of CT, MRI & PET CT
- Interaction physics as applied to radiation protection
- Basics of radiation shielding
- Operational dosimetry
- Radiation detection instrumentation
- Preparedness of radiation emergency
- Shielding calculations for medical facilities
- Risk assessment and protection design of radiation facilities
- Health physics statistics
- Radiation monitoring of personnel
- Internal exposure
- Environmental dispersion
- Biological effects

- Regulations
- Radiation protection in medical sectors
- Radiation injury and potential hazard in Medical sectors

DRAD7104 Magnetic Resonance Imaging – Principles and Its Applications (3 credits)

This course provides an in-depth understanding of the principles and applications of MRI technology and a hands-on practical session on diffusion-weighted imaging, offering students the chance to gain practical experience in the field.

The following topics will be covered:

- Introduction of MRI and signal source
- Excitation, signal detection, relaxation effect, and spin-echo
- Spatial encoding & image formation
- Principle of k-space and echo-planar imaging
- Hardware of MRI
- MRI image artifacts
- Control of image quality and contrast
- Scan acceleration with rapid gradient-echo
- Flow artifact and MR angiography
- Phase contrast MRI

DRAD7105 Molecular Imaging and Medical Cyclotron (3 credits)

This course provides a comprehensive understanding of the principles and applications of molecular imaging, with a specific focus on positron emission tomography (PET) and the use of medical cyclotrons. Students will gain hands-on experience in operating the medical cyclotron and automated synthesizers, and the quality assurance and acceptance testing of PET-CT.

DRAD7106 Nuclear Medicine Sciences (3 credits)

This course provides a comprehensive overview of key concepts in nuclear medicine, including the theoretical and practical aspects of nuclear medicine for clinical applications and research.

DRAD7107 Physics in Medical Imaging (3 credits)

This course is designed to provide students with a solid foundation in the principles, techniques, and applications of key medical imaging modalities, including Ultrasound Imaging, Computed Tomography (CT), Magnetic Resonance Imaging (MRI), and conventional/digital X-ray Imaging.

DRAD7108 Principles and Practice of Radiotherapy Physics (3 credits)

This course offers a comprehensive understanding of the fundamental principles and practical aspects of radiotherapy physics. Students will also gain hands-on experience in dose measurements, physics data for treatment planning, and dosimetry protocol through practical sessions.

The following topics will be covered:

- Electron beam physics

- Radiotherapy treatment machines
- Special procedures in radiotherapy
- Basic radiobiology in radiotherapy
- Acceptance tests and commissioning
- Treatment planning principles, techniques
- Treatment system
- Treatment simulation
- Radiation dosimetry and dose calculations

DRAD7109 Quality Assurance (QA) in Radiation Therapy and Medical Imaging (3 credits)

This course offers students a comprehensive understanding of the fundamental principles and practical aspects of QA in radiotherapy and medical imaging through a combination of lectures, tutorials and practical sessions.

The following topics will be covered:

- Quality management and patient safety
- Patient-specific QA in radiotherapy
- Machine QA in radiotherapy
- Machine QA in medical imaging

DRAD7110 Cardiac Computed Tomography and Cardiac Magnetic Resonance Imaging (3 credits)

This course provides a comprehensive understanding of the advanced imaging techniques used in the diagnosis and management of cardiac conditions.

- The following topics will be covered:
- Sequences, Acquisition, Contrast Agents & Basic Physics
- Cardiomyopathies, LGE & T2*
- Coronary Artery Disease, Aorta, Pericardium and Valves
- Congenital Heart Disease and Paediatric Scanning
- Advanced Techniques & Future Developments

DRAD7111 AI in Radiology and Medical Imaging (3 credits)

This course aims to provide students with the fundamental knowledge and applications of AI in radiology and medical imaging.

The following topics will be covered:

- Introduction to AI in Radiology
- Fundamentals of Medical Imaging
- Basics of AI and Machine Learning
- Medical Imaging Data & Image Processing
- Deep Learning in Medical Imaging
- Data Management and Medical Image Pre-processing
- Model Training and Evaluation
- AI in Medical Image Analysis: Segmentation
- AI in Medical Image Analysis: Classification
- Foundation Models in Radiology

- Workflow Integration and Ethical Considerations

DRAD7112 Medical Image Processing and Analysis (3 credits)

This course provides students with core concepts and practical skills in medical image processing. Through a "focused theory + hands-on practice" approach, students will learn to use various tools (e.g. Python & Matlab) to solve practical medical image problems using conventional techniques and AI approaches.

The following topics will be covered:

- Introduction to Medical Image Processing
- Image Acquisition, Formats, and Preprocessing
- Image Enhancement and Filtering
- Image Segmentation Techniques
- Morphological Operations and 3D Image Processing
- Image Registration and Alignment
- Feature Extraction and Quantitative Analysis
- Towards AI Diagnosis – Machine Learning and Feature Classificaion
- Towards AI Diagnosis – Deep Learning in Medical Imaging
- Clinical Integration & Future Perspectives

DRAD7113 Numerical Modeling Methods for Imaging and Treatment Systems (3 credits)

This course introduces numerical methods to model radiation-based medical devices, e.g., CT, PET, SPECT, and clinical linear accelerators. Students will learn the theoretical background of numerical modeling approaches through lectures. Additionally, students will learn practical skills for modeling medical devices through hands-on sessions.

The following topics will be covered:

- Introduction to numerical modeling,
- Review of X-ray and electron physics,
- Principles of the linear Boltzmann transport equation,
- Monte Carlo methods,
- Variance reduction techniques,
- Applications in the clinic (2 hands-on sessions), and
- Advanced approaches to accelerate the methods.

DRAD7114 Neuroimaging (3 credits)

This course aims to provide students with the fundamental knowledge neuroimaging.

The following topics will be covered:

- Introduction to neuroimaging
- Principles of Brain CT
- Principles of basic Brain MRI sequences
- Principles of advanced Brain MRI sequences
- Principles of basic Brain PET
- Application of Brain MRI + PET

MEDI7101 Current Therapeutic Strategies for Metabolic Diseases (6 credits)

This course introduces the therapeutic strategies for metabolic diseases, including drugs for obesity, diabetes, diabetic complications and lipid disorders, as well as functional food, nutraceuticals and traditional herbals for treating metabolic disorders. Life style modifications (calorie restriction, exercise, balanced diet, etc.) in the prevention of metabolic disorders will also be discussed. The course will also delve into the metabolic disease drug discovery from bench to bed.

MEDI7102 Current Topics in Energy Balance and Obesity (6 credits)

This course introduces students to the latest concepts on energy intake and expenditure, as well as modern technologies for obesity research. The course will cover a range of current topics surrounding energy balance and obesity, such as adipose tissue dysfunction, the role of brown adipose tissue in combating obesity, control of energy balance by the gut-brain-liver axis, and white adipose tissue as an energy storage organ and secretory gland.

MEDI7103 Recent Advances in Metabolic Disorders (6 credits)

The course aims to provide students with an overview of the recent advances in metabolic disorders. It explores a wide range of topics such as calcium metabolism and osteoporosis, cancer as a metabolic disease, genetically inherited metabolic disease, lipid abnormality, inflammation and atherosclerotic diseases, metabolic changes in autoimmune diseases, metabolic derangement in ageing, metabolic dysregulation and different types of diabetes, and mitochondrial disorders.

OSUR7101 Spine Surgery: Biomechanics and Assessment of Patients (6 credits)
OSUR7102 Spine Surgery: Intraoperative Spinal Cord Monitoring (6 credits)
OSUR7103 Spine Surgery: Laboratory Techniques (6 credits)

These courses aim to provide students with an in-depth study of spinal disorders and spine surgery, focusing on the biomechanics of the spine, intraoperative spinal cord monitoring, and laboratory techniques used in spine surgery.

OSUR7104 Joint Replacement Surgery: Applied Anatomy, Biomechanics and Biomaterials (6 credits)
OSUR7105 Joint Replacement Surgery: Operative Surgery (6 credits)
OSUR7106 Joint Replacement Surgery: Outcome Measurement (6 credits)

These courses cover contemporary knowledge and the basic science of joint replacement surgery, thereby enhancing students' practice and elevating the standard of care they provide. Students will learn practical tips for the management of arthritic conditions. The courses also provide training and opportunities for students to perform basic or clinical research and write capstone reports or scientific papers.

OSUR7107 Advanced Musculoskeletal Imaging: Anatomic and Kinesiological Examination of the Spine (6 credits)

OSUR7108 Advanced Musculoskeletal Imaging: Micro-CT and Paraspinal Muscle Imaging (6 credits)

OSUR7109 Advanced Musculoskeletal Imaging: Spinal Cord (6 credits)

These courses are designed to offer comprehensive training in advanced musculoskeletal imaging specifically geared towards spinal disorders, equipping students with the knowledge and skills necessary to navigate and leverage imaging technologies effectively in the diagnosis and management of musculoskeletal conditions.

OSUR7110 Orthopaedic Trauma Surgery: Fracture Healing and Biomechanics of Fixation Devices (6 credits)

OSUR7111 Orthopaedic Trauma Surgery: Operative Surgery (6 credits)

OSUR7112 Orthopaedic Trauma Surgery: Outcome Assessment (6 credits)

These courses provide students with updated knowledge in basic science and clinical management of fractures and dislocations, thereby enhancing and improving the standard of care in orthopaedic trauma. The courses also provide training and opportunities for students to perform basic or clinical research and write capstone reports or scientific papers.

OSUR7113 Orthopaedic Rehabilitation: General Principles (6 credits)

OSUR7114 Orthopaedic Rehabilitation: Rehabilitation of Spinal Cord Injury (6 credits)

OSUR7115 Orthopaedic Rehabilitation: Application of Electrodiagnosis and Ultrasound in Orthopaedic Practice (6 credits)

These courses equip students with up-to-date knowledge in the organisation and practice of orthopaedic rehabilitation. Students will acquire knowledge and skills essential for the rehabilitation of spinal cord injury, as well as the principles and practice of electrodiagnostic procedures in orthopaedic rehabilitation.

OSUR7116 AI and Orthopaedic Bioengineering: Fundamental Principles (6 credits)

OSUR7117 AI and Orthopaedic Bioengineering: Applications of Orthopaedic Bioengineering (6 credits)

OSUR7118 AI and Orthopaedic Bioengineering: AI-assisted Diagnostics and Treatment in Orthopaedic Practice (6 credits)

These courses are designed to provide a comprehensive understanding of the principles of bioengineering as applied to orthopaedics, integrating theories and practical applications. They aim to equip students with the foundational knowledge and skills necessary to engage in the development and evaluation of orthopaedic devices and technologies. Additionally, the courses foster critical thinking and innovation in the design and improvement of solutions for musculoskeletal diseases. They also cultivate interdisciplinary collaboration skills, emphasizing the integration of engineering, medicine, and biological sciences in orthopaedic bioengineering.

PAED7101 Molecular Diagnosis of Mendelian Diseases by NGS Technology (3 credits)

This course will explore the profound impact of next and third generation sequencing on the molecular diagnosis of Mendelian diseases and carrier screening, from families to population scale. We will delve into the technology, data analysis, and interpretation of genetic variants, including potential pitfalls leading to false positives or negatives.

The following topics will be covered:

- Impact of next and third generation long read sequencing on molecular diagnosis
- Role of sequencing technologies in carrier screening
- Understanding different genetic variants and potential issues
- Use of public genetic databases for diagnosis
- Evaluation of genetic variants and genotype-phenotype correlations
- Introduction to common causal genes in various diseases and considerations in diagnosis

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PAED7102 Genetic Studies of Complex Diseases (3 credits)

The course is designed to provide a deep understanding of how genetic variations contribute to complex diseases. This course will cover a broad range of topics, from genome-wide association studies to the functional characterisation of susceptible variants, and the use of polygenic risk scores for personalised risk prediction and disease prevention.

The following topics will be covered:

- Genome-wide association studies
- Power, sample collection, and population stratification
- Association analysis, imputation, fine-mapping and meta-analysis
- Phenotypic stratification
- Characterization of susceptible variants
- Use of polygenic risk scores for personalized risk prediction

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PAED7103 Cancer Genomics and Precision Treatment (3 credits)

The course is designed to provide an in-depth understanding of how genomics are revolutionising cancer diagnosis and treatment. It will focus on the genomic alterations that drive cancer progression and how this knowledge is being harnessed to develop precision treatments tailored to individual patients.

The following topics will be covered:

- Overview of cancer genomics: Understanding the genetic alterations that drive cancer
- Techniques in cancer genomics: Exploring the methods used to identify and characterise cancer-associated genomic alterations
- Precision oncology: Exploring how genomic data is used to guide individualised cancer treatment
- Case studies in precision oncology: Reviewing real-world examples of how genomics has improved cancer treatment
- Future directions in cancer genomics and precision treatment: Discussing emerging techniques and therapies, and considering the future of personalised cancer treatment

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PAED7104 Scientific Methods, Experimental Design, and Data Interpretation in Genetics and Genomics (3 credits)

This course is designed to provide students with a solid foundation in the key aspects of scientific research in the fields of genetics and genomics. The course aims to equip students with the necessary skills to design robust experiments, apply appropriate scientific methods, and accurately interpret complex genetic and genomic data.

The following topics will be covered:

- Understanding the scientific method in genetic and genomic research
- Principles of experimental design in genetics and genomics
- Techniques for data collection and analysis in genetic studies
- Strategies for interpreting complex genetic and genomic data
- Evaluation and critical analysis of genetic and genomic research
- Ethical considerations in genetic and genomic studies

PATH7102 Current Topics and Techniques in Immunology (3 credits)

This course provides an overview of immunology and major topics in recent research advances and current techniques. It covers a wide range of topics such as innate and adaptive immunity, B and T cell development and function, T cell subsets and functions, T regulatory cells generation and function, inflammation and cancer, infection and immunity, stem cells and their immunoregulatory function, and immunohistochemistry in diagnostic pathology.

PATH7103 Molecular and Clinical Laboratory Immunology Methods and Applications (3 credits)

This course introduces molecular and clinical laboratory immunology methods with applications in allergic diseases, autoimmune diseases, immunodeficiency diseases, and monoclonal gammopathy. Students will gain knowledge of laboratory immunology techniques (molecular, serological, and cellular), quality assurance and accreditation issues, immunization, vaccines and immunotherapies.

PATH7104 Molecular Genetics and Cytogenetics of Cancer (6 credits)

This course discusses the genetic basis of cancer and its implications for clinical diagnosis, prognostication and monitoring of different types of cancers, including gynaecological tumours, gestational trophoblastic disease, haematological malignancy, liver cancer, lung cancer, nasopharyngeal carcinoma, Paediatric sarcomas and other soft tissue tumours.

PATH7105 Techniques and Applications of Molecular Pathology (6 credits)

This course delves into the techniques and applications of molecular pathology, focusing on various aspects such as virus-related diseases, diagnosis of malignant lymphoma, detection of genetic alterations in solid tumours, defects in DNA mismatch repair, genetic screening for cancer susceptibility, and molecular aspects of haematology including globin disorders and bleeding disorders. The course will also discuss Next Generation Sequencing and its clinical applications, as well as DNA and its impact on human ID.

PHAR7101 Advanced Drug Delivery and Drug Development (6 credits)*

The course aims to provide a broad overview of current trends of drug development. The advances in drug delivery, the application of analytical techniques in pharmaceutical analysis, and the trends in biopharmaceutical manufacture will be discussed.

PHAR7102 Evidence-Based Practice (3 credits)*

The course will introduce the concepts of clinical epidemiology and biostatistics that are essential components of evidence-based practice. Various study designs and methodologies used to investigate associations between risk factors, interventions and disease outcomes will be covered. The course will also shed light on the steps of evidence-based practice with clinical cases, and the important concepts of critical appraisal of literature to guide clinical decision-making. Students will gain practical guidance on navigating the research journey as new investigators. Topics include the development of research question, literature review, study design and methods, research ethics, preparation of research protocol, and manuscript preparation.

PHAR7103 Health Informatics and Big Data (3 credits)*

This course introduces the use of health data in population health, research and practice. Students will learn about databases and data types in clinical informatics, and they will recognise the different sources of clinical and population level data, and how to formulate data questions. The course will cover basic concepts of the application of big data, machine learning and artificial intelligence in healthcare.

PHAR7104 Therapeutic Antibodies (3 credits)*

Students will understand the principles of monoclonal antibody-based therapies, their pharmacokinetic and pharmacodynamic properties and their clinical uses. The course will also discuss the technologies in therapeutic antibody engineering and contemporary development of therapeutic antibodies in cardiovascular, metabolic and cancer diseases.

PHAR7105 Introduction to Pharmaceutical Industry (3 credits)*

This course provides an overview of key department functions in the pharmaceutical industry, including medical affairs, regulatory affairs, quality assurance/control, pharmacovigilance, production, and marketing and sales. Experts in the pharmaceutical industry will share their experiences in each of these topics. This course will cover both Western and Chinese medicines.

PHAR7106 Advanced Therapy Products (3 credits)*

The course introduces the fundamental scientific principles and potential clinical applications of advanced therapy products including somatic cell therapy product, tissue engineered product and gene therapy product, as well as the regulatory framework, good practice and relevant accreditations.

MSBS7101 Essential Skills in High-throughput Sequencing Data Analysis (6 credits)*

This course aims to provide a practical introduction to the analysis of genomics, transcriptomics, and other omics data using statistical and bioinformatics approaches. Students will learn essential workflows, data processing techniques, and analytical methods for interpreting high-throughput sequencing data. Topics include quality control, alignment, variant calling, differential expression analysis, and integrative multi-omics approaches. Hands-on exercises with real datasets will reinforce key concepts and develop proficiency in relevant tools and scripting. By the end of the course, students will be familiar with the analysis and interpretation of next-generation sequencing data for biomedical research and clinical applications.

The following topics will be covered:

- Linux and shell scripting
- Genome browsing and visualisation
- Operating on genome intervals
- Next-generation sequencing alignment
- Variant calling and annotation
- RNA sequencing analysis
- Epigenetics and DNA methylation
- ChIP sequencing and chromatin profiling

MSBS7102 Foundations in Biomedical Data Science (6 credits)*

This course offers a comprehensive introduction to the computational and statistical foundations of biomedical data analysis. Students will gain essential programming skills and an understanding of fundamental data structures relevant to bioinformatics. Key statistical methods—including probability, hypothesis testing, regression, and introductory machine learning—are explored through applications in biomedical research. Hands-on exercises with real-world datasets help develop practical skills in data analysis, visualisation, and interpretation. By the end of the course, students will develop a solid foundation for working with biomedical data and applying computational techniques in research or industry settings.

The following topics will be covered:

- Advanced R programming for biomedical data science
- Statistical modelling & machine learning
- Biomedical databases & big data technologies
- Generative AI in biomedicine
- Advanced data visualization & interpretability
- Data science for precision medicine & healthcare delivery

SURG7101 Risk Calculation and Effective Communication in Genetic Counselling (3 credits)

This course equips students with essential knowledge and skills in genetic counselling. It covers basic genetic terms to understand and interpret genetic reports, pedigree analysis, risk assessment and calculations, code of ethics and effective communication strategies in various case scenarios. Students will gain practical experience through role plays and analysis of counselling transcripts or videotapes.

SURG7102 Advancements in Genomics (3 credits)

This course offers an overview of current genomic technologies and their applications, including direct-to-consumer testing, bioinformatics, molecular toolbox, next-generation sequencing, and DNA repairs. It also introduces the latest developments and regulatory aspects of genetic testing, public health genomics, genetic services in Hong Kong, gene-environment-disease interaction, pharmacogenomics, genetic screening, and genetic report interpretation. Ethical issues in genetic counselling will also be discussed.

SURG7103 Genetics in Medicine 1 (Prenatal) (3 credits)

This course offers a comprehensive overview of prenatal genetics, covering a wide range of topics from pre-pregnancy genetic counselling, reproductive genetic counselling, pregnancy and antenatal

screening, fetal ultrasonography and counselling, prenatal diagnosis and counselling, to pregnancy termination.

SURG7104 Genetics in Medicine 2 (Paediatrics) (3 credits)

This course introduces students to the basics of paediatric genetic disorders, such as cardiovascular genetics and connective tissue disorders, growth disorders, neurogenetics, cancer and developmental delays. Students will learn about common paediatric syndromes, newborn screening, genetic counselling for disorders in children and adolescence, as well as parents facing neonatal genetic diseases. The course will include case discussions and sharing by patient groups to enhance students' learning of the topics.

SURG7105 Genetics in Medicine 3 (Cancer) (3 credits)

This course introduces students to the genetics, management and precision therapeutic treatment for hereditary cancers and related syndromes. Students will learn the techniques of genetic counselling for cancer patients and families and critically appraise cancer genetics publications.

SURG7106 Clinical Scenarios Workshop (+/- Clinical Attachment) (3 credits)

This workshop offers clinical scenarios on various genetic diseases and disorders for students to develop the skills needed to conduct genetic counselling sessions with professionalism and empathy. Students may be arranged to observe outpatient clinical (OPD) under doctors' supervision, subject to availability.

Capstone Course List

Course Code	Course Name	Credits
MMSC6001	Academic Writing	N/A
MMSC6003	Research Ethics	N/A
DRAD7000	Capstone: Clinical Physics in Radiation Oncology and Medical Imaging	27
MEDI7000	Capstone: Metabolic Medicine	27
OSUR7000	Capstone: Advanced Musculoskeletal Research and Practice	27
PAED7000	Capstone: Genomics and Bioinformatics	27
PATH7000	Capstone: Clinical and Molecular Pathology, Haematopathology, and Immunology	27
PHAR7000	Capstone: Pharmaceutical Science and Applications in Health Care	27
SURG7000	Capstone: Genetic Counselling	27

MMSC6001 Academic Writing (10 hours)

This workshop aims to raise students' awareness of essential aspects of academic writing that contribute to the overall communicative success of a capstone report.

The following topics will be covered:

- Citing research
- Communicative success in reporting research
- Features of scientific research language
- Discussing the use of GenAI in capstone report writing
- Reviewing the literature
- Structure of capstone reports: The IMRaD formula
- Organization of an abstract
- The introduction: Stating the research gap and use of verb tenses
- The discussion section: Making claims
- The conclusion section
- Writer's stance
- Synthesis of ideas
- Use of academic tone
- Academic honesty and techniques to avoid plagiarism

By the end of the workshop, students will be able to approach their writing with confidence and apply skills at key stages of their research process.

MMSC6003 Research Ethics (5 hours)

To raise students' awareness of the importance of research integrity, accountability and research ethics, all candidates will be required to pass the web-based learning course on Epigeum Research Integrity Programme developed by Oxford University Press. The course covers principles and practices related to research integrity in the science field, including values of research integrity, principles of responsible research conduct and their application to students' own research.

DRAD7000 Capstone: Clinical Physics in Radiation Oncology and Medical Imaging (27 credits)

MEDI7000 Capstone: Metabolic Medicine (27 credits)

OSUR7000 Capstone: Advanced Musculoskeletal Research and Practice (27 credits)

PAED7000 Capstone: Genomics and Bioinformatics (27 credits)

PATH7000 Capstone: Clinical and Molecular Pathology, Haematopathology, and Immunology (27 credits)

PHAR7000 Capstone: Pharmaceutical Science and Applications in Health Care (27 credits)

SURG7000 Capstone: Genetic Counselling (27 credits)

The Capstone Course offers a valuable opportunity for students to apply the skills and knowledge gained throughout the programme in a self-directed project under the supervision of a faculty member. Students will produce an original and substantive piece of work (capstone report) on a selected topic as agreed upon by the supervisor, and present their work if required by the examiner.