

REGULATIONS FOR THE MASTER OF MOLECULAR AND DIAGNOSTIC PATHOLOGY (MMDPath)

These regulations apply to candidates admitted to the MMDPath in the academic year 2023-24 and thereafter.

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

MMP.129 Admission requirements

To be eligible for admission to the courses leading to the Master of Molecular and Diagnostic Pathology, a candidate shall:

- (a) comply with the General Regulations and the Regulations for Taught Postgraduate Curricula; and
- (b) hold a Bachelor's degree with honors or a degree of MBBS of this University, or another qualification of equivalent standard from this University, or from another University or comparable institution accepted for this purpose; and
- (c) satisfy the examiners in a qualifying examination, if required.

MMP.130 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.

MMP.131 Award of degree

To be eligible for the award of the Master of Molecular and Diagnostic Pathology, a candidate shall

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

Advanced standing may be granted to a candidate in recognition of prior studies completed at a comparable level before admission to the Master of Molecular and Diagnostic Pathology subject to the following conditions:

- (a) such course(s) should be completed no more than 5 years prior to the candidate's commencement of the Master of Molecular and Diagnostic Pathology curriculum;
- (b) such course(s) should be appropriate for the Master of Molecular and Diagnostic Pathology courses the candidate has applied for; and
- (c) advanced standing for up to 12 credits may be granted.

MMP.132 Period of study

The curriculum shall normally extend over two academic years of part-time study. Candidates shall not be permitted to extend their studies beyond the maximum period of registration of four academic years of their part-time study, unless otherwise permitted or required by the Board of the Faculty.

MMP.133 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 credit units 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 dissertation approved by the Board of Studies.

A candidate who fails to fulfil the requirements within the prescribed maximum period of study shall be recommended for discontinuation under the provision of General Regulation G12, except that a candidate who is unable because of illness or circumstances beyond his/her control to complete the requirements within the prescribed maximum period of study, may apply to the Board of Studies for permission to extend his/her period of studies.

MMP.134 Title of dissertation

The title of the dissertation shall be submitted for approval in the year of graduation. The candidate shall submit a statement that the dissertation represents his/her own work (or in the case of conjoint work or work on a secondary dataset, a statement countersigned by his/her co-worker/supervisor, which shows his/her share of the work) undertaken after registration as a candidate for the degree.

All dissertations may be subject to oral examination.

MMP.135 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 examination(s); or
 - (iv) to enrol in another course in lieu if the failed course is not a core course.
- (b) A candidate who has presented an unsatisfactory dissertation in the first attempt may be permitted to revise the dissertation and to re-present it within a specified period of not more than four months after receipt of a notice that it is unsatisfactory.
- (c) A candidate who has failed to satisfy the examiners in the second attempt in any course(s), or dissertation, or exceeded the prescribed maximum period of registration shall be recommended for discontinuation of studies under the provisions of General Regulation G12, or may be required to exit the curriculum by the Faculty Board, on recommendation of the Board of Examiners, with an award of Postgraduate Diploma in accordance with M.131.

MMP.136 Grading system

Individual courses (i.e. Core Course, Elective Course and Dissertation) shall be graded according to the grading system of “Pass” or “Fail”.

MMP.137 Examination results

At the conclusion of the examinations, a pass list will be published. A candidate who has shown exceptional merit in all examinations may be awarded a mark of distinction which shall be recorded in the candidate’s transcript.

SYLLABUSES FOR THE DEGREE OF MASTER OF MOLECULAR AND DIAGNOSTIC PATHOLOGY (MMDPath)

The Master of Molecular and Diagnostic Pathology curriculum consists of 27 credit of core courses, 27 credits of elective courses and 18 credit units of capstone experience (dissertation), requiring fulfillment of a minimum of 69 credit units of teaching and prescribed work.

Candidates should satisfy the examiners in all summative assessments. Summative assessment may be comprised of both coursework and examination.

MMDP7009, MMDP7011, MMDP7012, MMDP7013 and MMDP7014 are assessed 100% through coursework. MMDP7008 is assessed 100% through examination. The other courses are assessed 20-60% through coursework and the corresponding 40-80% through examination.

Candidates are also required to submit a dissertation MMDP7006 to the satisfaction of the examiner(s).

COURSES

Students are required to complete the 3 core courses and a minimum of 3 elective courses of which at least one Diagnostic Pathology course must be included. All candidates are required to complete a dissertation (capstone report).

CORE

Course Code	Course Name	Credits
MMDP7001	Principles and Techniques of Molecular Pathology	9
MMDP7002	Clinical Applications of Molecular Testing	9
MMDP7003	Fundamentals of Genetic Testing for Hereditary Disorders	9

MMDP7006	Dissertation	18
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ELECTIVES

Molecular Pathology Courses		Credits
MMDP7007	Practical Course in Laboratory Methods	6
MMDP7009	Clinical Applications of Genetic Testing in Inherited Diseases and Genetic Counselling	9
MMDP7019	Applications of Emerging Technologies for Genetic Testing	9

Diagnostic Pathology Courses		Credits
MMDP7004	Chemical Pathology, Diagnostic Haematology and Transfusion Medicine	9
MMDP7005	Essential Anatomical Pathology of Epithelial tumors	6
MMDP7015	Essential Anatomical Pathology of Non-epithelial tumors	3
MMDP7008	Molecular Microbiology	3
MMDP7010	Renal Pathology, Immunology and Transplant Related Pathology	9
MMDP7011	Clinical Placement in Diagnostic Molecular Pathology	6
MMDP7012	Clinical Placement in Haematology	6
MMDP7013	Clinical Placement in Chemical Pathology	6
MMDP7014	Clinical Placement in Immunology	6

Master of Medical Science courses available for PDipMDPath graduates only		Credits
MMDP7020	Molecular Genetics and Cytogenetics in Cancer	6
MMDP7021	Molecular and Clinical Laboratory Immunology Methods and Applications	3
MMDP7022	Blood Cell and Bone Marrow Pathology	3
MMDP7023	Current Topics and Techniques in Immunology	3
MMDP7024	Laboratory Methods and Instrumentation	3
MMDP7025	Recent Advances in Cancer Biology	3
MMDP7026	Principles to Genetic Counselling	3
MMDP7027	Practical Bioinformatics	3

COURSE LIST

MMDP7001 Principles and Techniques of Molecular Pathology (9 credits)

This course will provide an introduction to diagnostic molecular pathology tests and the techniques of molecular pathology, such as RNA, DNA and protein analysis, the principles and applications of quantitative-PCR, the principles of automated DNA sequencing and the various methods of genotyping and mutation analysis, human identity by DNA typing, basic concepts in conventional cytogenetics and molecular cytogenetics, in-situ hybridization techniques (ISH, FISH, CISH, SISH) and the principles and applications of flow cytometry. The emerging technologies of gene expression profiling and next generation sequencing will also be introduced. The consideration of laboratory management and ethical issues in molecular testing, with regard to laboratory organization and safety will be covered.

MMDP7002 Clinical Applications of Molecular Testing (9 credits)

The focus of this course is the principles of molecular testing with regard to clinical applications. This includes principles of HPV testing, its clinical relevance and the various methods of genotyping; hepatitis B virus infection – testing for viral load and HBV DNA mutants detection; methodologies for detection and quantification of EBV DNA plasma for EBV associated diseases; KRAS mutation detection for colorectal cancer; targeting KRAS mutation in activity-based compounds for cancer therapy; gene rearrangement studies and gene expression profiling for haematolymphoid malignancies; detection of BCR/ABL fusion transcript and kinase domain mutation in CML; EGFR and other common molecular targets in lung cancer management; c-kit mutation in GISTs; RET and Menin gene mutation in MEN syndromes; quantitative in-situ hybridization for HER2 amplification; molecular strategies for detecting chromosomal translocations in soft tissue tumours; and laboratory management issues in molecular testing.

MMDP7003 Fundamentals of Genetic Testing for Hereditary Disorders (9 credits)

This course provides a comprehensive introduction to molecular genetics. It will cover the molecular genetics in paediatrics; genetic testing for familial colorectal cancer; genetic testing for familial breast and ovarian cancer; genetic diagnosis of globin disorders; molecular genetics of lipid disorders; and laboratory management issues in genetic testing.

A three-day practical laboratory session will be conducted for all registrants of MMDP7001/7002/7003 which will provide hands-on laboratory experience of the various techniques involved in molecular testing. The session will be arranged over the weekend with opportunity for overseas students to attend in person if possible.

MMDP7006 Dissertation (18 credits)

A dissertation of at least 5,000 words (excluding references), to demonstrate application of the knowledge acquired from this curriculum. Students are required to consult the capstone supervisor for guidance in the selection of topic and writing of the capstone report.

The dissertation may be based on clinical or laboratory data obtained from the candidate's or supervisor's workplace or practice, or a review of existing literature and should demonstrate any of the following aspects: assessing the need, applicability/cost effectiveness of specific molecular tests in Hong Kong or abroad; surveying the relative frequency/characteristics of specific disease profiles in relation to molecular/genetic testing; addressing possible drawbacks or ethical issues; quality assurance measures to be considered specifically in this setting, etc.

MMDP7007 Practical Course in Laboratory Methods (6 credits)

This course provides practical sessions on tissue processing, immunohistochemistry and histological analysis; basic tissue culture techniques and flow cytometry analysis; extraction methods for DNA, RNA, protein and electrophoresis; and reverse transcription, polymerase chain reaction, and DNA sequencing.

MMDP7009 Clinical Applications of Genetic Testing in Inherited Diseases and Genetic Counselling (9 credits)

This course introduces the general principles of cytogenetics, biochemical genetics and molecular genetics in genetic testing and the various laboratory techniques for identification of disease-causing mutations. Through the practical sessions and group discussion, students will learn how to read a laboratory report. Topics will include principles of genetic counselling with its ethical and legal aspects; bioinformatics for mutation reporting; biochemical diagnosis of acute inborn errors of metabolism patients; autistic spectrum disorder; renal and pulmonary genetics; pharmacogenetics; neurogenetics and neuromuscular disease; Pre-natal genetics including constitutional cytogenetics, pre-natal molecular cytogenetics, pre-implantation genetic diagnosis with practicum in interpretation of reports; clinical genome and exome sequencing with NGS case application; clinical consultation cases tutorial; the undiagnosed diseases programme; tutorials on neurogenetics and neuromuscular disease, inherited metabolic disease and endocrine disorders, inherited bone disease, mitochondrial disease, lysosomal storage disease. Laboratory visit to the Centre for Panoramic Science which provides comprehensive genomics and bioinformatics, as well as proteomics, metabolomics, imaging and flow cytometry services and platforms by the LKS Faculty of Medicine, the University of Hong Kong will be arranged.

MMDP7019 Applications of Emerging Technologies for Genetic Testing (9 credits)

This advanced course introduces third generation long-read sequencing with its clinical applications. Clinical bioinformatics including the polygenic risk score will also be introduced. Bioinformatics for mutation reporting in chemical pathology and haematology as well as clinical applications of next-generation sequencing for solid tumours will be covered. The Human Genome Project in Hong Kong will be introduced. Other topics include mass-spectrometry (protein/metabolite) for drug discovery; expanded new-born screening for metabolic disease; inherited cardiomyopathy and arrhythmia disorders, artificial intelligence and CRISPR gene editing technology for treatment and diagnosis. Laboratory visits to genetic laboratories in Hong Kong will be arranged.

**MMDP7004 Chemical Pathology, Diagnostic Haematology and Transfusion Medicine
(9 credits)**

This course will cover topics on the interferences in laboratory testing; clinical toxicology; diabetes mellitus and endocrine disorders; renal and liver function tests; cardiac markers; point-of-care testing; tumour markers; diagnostic haematology tests; haemoglobinopathies; clotting issues; transfusion medicine; and laboratory management. Laboratory visit will be arranged.

MMDP7005 Essential Anatomical Pathology of Epithelial Tumours (6 credits)

This course introduces essential concepts of anatomical pathology in relation to tumours of the breast, the respiratory tract, liver and GI tract and common gynaecological diseases, such as the relevance of classification, cytological, histopathological and molecular considerations and devices, for diagnosis and management, including laboratory management.

MMDP7015 Essential Anatomical Pathology of Non-epithelial Tumours (3 credits)

This course introduces essential concepts of anatomical pathology in relation to non-epithelial tumours, including bone and soft tissue tumours, tumours of the central nervous system, endocrine tumours and haematolymphoid malignancies, such as the relevance of classification, cytological, histopathological and molecular testing for diagnosis and management.

MMDP7008 Molecular Microbiology (3 credits)

This course introduces molecular approaches including MALDI-TOF-MS technology, rapid viral quantitation and drug resistance determination, the principles of molecular phylogenetic analysis and molecular typing method for clinical application in bacteriology, virology, mycology and parasitology, epidemiological surveillance and outbreak management. Laboratory and epidemiological considerations for data interpretation, and the limitations and future perspectives of genomic techniques will be addressed. Bacterial pathogens include typical and atypical, mycobacterium species, the diagnosis of sepsis, infections of gastrointestinal tract and central nervous system. Clinical application in virology include viral pathogens: hepatitis, enteric and respiratory viruses; rapid quantitation of HIV and drug resistance determination; clinical application in mycology and parasitology - fungal pathogens, parasitic pathogens.

MMDP7010 Renal Pathology, Immunology and Transplant Related Pathology (9 credits)

This course will cover topics on the basic immunology concepts in relation to transplantation; the role of immunogenetics in transplantation; basics of renal biopsy: laboratory handling and principles of pathological interpretation; native renal biopsy: glomerular diseases and tubular, interstitial and vascular diseases; allograft biopsy: introduction and Banff classification of renal transplant pathology and allograft pathology; liver transplant pathology; lung transplant pathology; cardiac transplant pathology; bone marrow transplant related pathology; basic techniques and management in clinical laboratory immunology; routine immunochemistry, autoantibody and clinical laboratory immunology tests with case study, tutorial on the service of a referral centre and laboratory visit.

MMDP7011 Clinical Placement in Diagnostic Molecular Pathology (6 credits)

This course provides practical exposure to diagnostic genetic molecular testing on anatomical pathology clinical samples, with first-hand observation experience. This includes understanding the

molecular basis of each test, its application, the techniques involved, pre-analytical, analytic and post-analytical considerations, work flow, interpretation and reporting of tests, quality control, quality assurance, laboratory safety, and laboratory accreditation.

MMDP7012 Clinical Placement in Haematology (6 credits)

This course provides practical exposure in a clinical haematology laboratory with first-hand observation experience in the handling of clinical samples for diagnostic and genetic testing. This includes understanding the basic principles behind each test, its application, the techniques involved, pre-analytical, analytic and post-analytical considerations, work flow, interpretation and reporting of tests, quality control, quality assurance, laboratory safety, and laboratory accreditation.

MMDP7013 Clinical Placement in Chemistry Pathology (6 credits)

This course provides practical exposure in a clinical chemistry laboratory with first-hand observation experience in the handling of clinical samples for diagnostic and genetic testing. This includes understanding the molecular basis of each test, its application, the techniques involved, pre-analytical, analytic and post-analytical considerations, work flow, interpretation and reporting of tests, quality control, quality assurance, laboratory safety, and laboratory accreditation.

MMDP7014 Clinical Placement in Immunology (6 credits)

This course provides practical exposure in a clinical chemistry laboratory with first-hand observation experience in the handling of clinical samples for diagnostic testing. This includes understanding the molecular basis of each test, its application, the techniques involved, pre-analytical, analytic and post-analytical considerations, work flow, interpretation and reporting of tests, quality control, quality assurance, laboratory safety, and laboratory accreditation.

MMDP7020 Molecular Genetics and Cytogenetics in Cancer (6 credits)

This course introduces molecular genetics of cancer which includes cancer genomic/genetic analyses for precision treatment; cancer epigenetics; conventional and molecular cytogenetics practice; hypoxia and cancer; the molecular pathogenesis and the molecular basis and characterization of new genes in liver cancer; nasopharyngeal carcinoma - molecular aspects and relationship to EBV; and the molecular genetics of gynaecological tumours and gestational trophoblastic disease, lung cancer, haematological malignancy including acute leukaemia and myeloproliferative neoplasms, paediatric sarcomas and other soft tissue tumours.

MMDP7021 Molecular and Clinical Laboratory Immunology Methods and Applications (3 credits)

This course will introduce the application of molecular and clinical laboratory immunology methods to the testing of allergic diseases, autoimmune diseases, immunodeficiency diseases, and monoclonal gammopathy. It will also cover molecular, serological and cellular techniques in laboratory immunology as well as quality assurance and accreditation issues.

MMDP7022 Blood Cell and Bone Marrow Pathology (3 credits)

This course will cover the topics of lymphoproliferative neoplasms; myelodysplastic syndromes and acute myeloid leukaemia; myeloproliferative neoplasms; the approach to bleeding disorders; red cells disorders: an overview and non-malignant disorders; the haemopoietic system; white cells disorders: an overview and non-malignant disorders; basic blood bank serology and transfusion in clinical practice

MMDP7023 Current Topics and Techniques in Immunology (3 credits)

This course will cover the topics of 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; immunohistochemistry in diagnostic pathology.

MMDP7024 Laboratory Methods and Instrumentation (3 credits)

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

MMDP7025 Recent Advances in Cancer Biology (3 credits)

This course aims to introduce emerging concepts in cancer biology as well as cutting edge topics in cancer research. It will cover the genetic aspects of cancer heterogeneity; cancer metastasis; cancer epigenetics; RNA splicing in cancer; cancer stem cells; cancer metabolism; tumor microenvironment; cancer immunology; mouse models in cancer research; surgical pathology in the management and prognostication of common human cancers

MMDP7026 Principles to Genetic Counselling (3 credits)

This course provides the basis to understanding of human genetics and genetic disorders. It provides an overview of the roles and duties of a genetic counsellor in genetic assessment and result disclosure. It aims to develop basic clinical skills to conduct interviews, present relevant genetic information to patients and families, and facilitate informed decision. This includes being able to recognize the ethical, legal and policy issues related to genetic testing and genomic development, and to understand the basis of human genetics and genetic disorders. It will include an introduction to human genetics and inheritance; and cover the topics of 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 these topics.

MMDP7027 Practical Bioinformatics (3 credits)

This course aims to provide students with the basic understanding of the principles and latest developments/tools in bioinformatics. This includes biological databases; gene prediction; information retrieval: entrez and SRS. It will introduce the essential concepts on gene structure and sequence, protein structure and function, and cover the topics of multiple sequence alignment; pair-wise sequence alignment I: dot plots; pair-wise sequence alignment II: dynamic programming; phylogenetic prediction; sequence database searches: BLAST, FASTA and substitution matrices.
