Master of Science in Molecular Medicine

Program Overview

Molecular medicine can be defined as the branch of biomedical science that studies, diagnoses and treats pathological conditions at the molecular level. This branch is readily evolving, encompassing emerging fields such as medical genetics, pathology, clinical diagnostics and companion diagnostics, nanomedicine, and immunology.

Technological advances in molecular biology and biomarker discovery and assessment have revolutionized the practice of clinical medicine over the past decade. To name a few, cancer immunotherapy, pathology, nanomedicine, gene therapy of inherited diseases, next-generation sequencing, and the engineering of biologic therapies.

Increasingly, research scientists, medical professionals and biomedical researchers in the health and life sciences must understand and evaluate advances in molecular medicine to keep abreast of developments in their fields and capably exploit this knowledge, emerging evidence, global challenges, and training in areas related to immunology, nanomedicine, and genetics.

The purpose of the Master of Science in Molecular Medicine program is to develop knowledge and skills in cellular and molecular biology, molecular diagnostics, and molecular mechanisms of disease. Graduates can implement their acquired skills and knowledge in both research and practical clinical work and will contribute to an increased understanding of pathological processes, diagnostics, biomarker discovery, molecular mechanisms, and treatment of diseases.

The College of Medicine and Medical Science (CMMS), Arabian Gulf University (AGU), while consolidating its undergraduate innovative educational programs, initiated postgraduate programs offering Ph.D. degree in molecular medicine in 2006. The current program, among other purposes, prepares and trains students who wish to enroll in the Ph.D. degree in molecular medicine.

This program has a strong focus on research providing a research-led teaching experience and is suitable for students with a background in biomedicine and molecular biology. The courses are designed to appeal to both clinical and basic biomedical scientists and provide comprehensive theoretical and practical training using state-of-the-art techniques in molecular and cellular biology as applied to medicine.

Vision

To be a unique, innovative, and effective educational and research program serving the health needs of the GCC citizens, and contributing globally to excellence in research and development, clinical services, and health education.

Mission

The Master of Science in Molecular Medicine program seeks to drive innovation in GCC in this emerging field of biomedical science, leading to measurable impact in discovery and healthcare quality, capitalizing on its interdisciplinary theme at the interface of molecular mechanisms of disease with medicine.

Program Objectives

- To acquire diverse and relevant modern skills, among them mastering selected techniques for analysis, measurements and manipulation of molecules involved in normal physiology and disease to improve diagnosis, treatment, and prevention of diseases.
- To professionally and competently express biomedical scientific findings in oral and written venues, and through the production of high-quality research communications.
- To obtain a theoretical basis of fundamental principles vital to understand and identify key molecules and biomarkers essential for normal physiological functioning and those related to deep-seated mechanisms of diseases.
- To conduct mission-oriented research directed to resolving a modern medical issue via in-depth investigations, and analysis of molecular mechanisms in disease and health.

Program Areas of Specialization

The Program offers specialties in the following areas:

- Molecular Genetics
- Nanomedicine
- Molecular Immunology

The master thesis should be specific to one of the three major areas of the program.

Learning Outcomes

By the end of this program, graduates should be able to:

1. Demonstrate core knowledge of molecular and cellular biomedical sciences that intersect pathological, genomic, and immunological aspects of disease and health.
2. Demonstrate working knowledge of normal human physiology at the molecular level and how these are distinguished in states of disease using a molecular marker/diagnostics approach.
3. Demonstrate skills in basic biomedical, translational, or clinical molecularly focused research, depending on selected focus.
4. Demonstrate practical knowledge and skills that allow the student to identify molecular disease mechanistic and diagnostic features.
5. Demonstrate effective oral and written communication skills.
6. Demonstrate the ability to interact and work effectively with others in a professional setting.
7. Demonstrate professional ethics necessary for the responsible conduct of biomedical research.

8. Demonstrate other "soft" professional skills (e.g., critical thinking, problem solving, career planning, networking) that facilitate career direction, advancement, and commitment to life-long learning.
9. Be able to draft an individual career development plan.

Program Outline

Master of Science
The master program is a 2-year program organized as follows:
The formal curriculum is organized in 2 semesters (16 weeks duration per semester) spread over the first academic year. The first semester consists of core courses, while the second semester is devoted to specific courses. The student is required to take all didactic courses in the first and second semester. The third and fourth semesters in the second academic year are dedicated to research and writing of thesis (8 credit hour thesis project).

First year
- The first semester program consists of core courses (13 credit hours).
- The second semester program consists of specific courses (15 credits hours).

Second year
The Master of Science candidate undertakes further specialized training and conducts a research project. The student is required to submit a written thesis and defend it orally in front of an examining committee comprising university faculty and invited qualified faculty guests comprising a committee of (3) examiners. Thesis research work is spread over the two semesters of the second academic year. Topics for the thesis will be decided in consultation with the thesis supervisor, taking into consideration the students' interests and ongoing research activities. Thesis work can be partly performed by the student in his/her institution provided that a qualified supervisor is identified, and technical facilities are available to carry out the planned experiments. Internal and external examiners evaluate the written dissertation and examine the student orally. The program is implemented by a director and decisions are made by an academic committee consisting of members representing the major specialties in the program. The Master of Science degree requirements include 28 credit hours of courses and a thesis of 8 credit hours to be completed within two academic years (total 36 Credit Hours).

Diploma
The diploma program is a one-year program organized as follows:
- The formal curriculum is organized around two semesters (16 weeks duration each).
- The first semester consists of five core courses and the second semester is devoted to specific courses (Total 24 Credit Hours).
- The two semesters are spent in formal classroom and laboratory learning.
- Interactive resource sessions and laboratory activities allow the students to expand their knowledge, share experiences and acquire up-to-date laboratory methodology.
- During coursework, the student prepares a Diploma project (4 credit hours).

Outline of Coursework

A total of 36 credits hours of course work, inclusive of a master thesis project, equivalent to 8 hours. Didactic courses cover 28 credit hours as listed below.

A: Core Courses (First Semester)

The requirement for core courses is 13 credits hours.

Course Code	Course Name	Credit Hours
CMMS604	Research methodology	2 Credits
CMMS621	Inferential statistics and its applications	2 Credits
CMMS622	Topics in analytical chemistry	2 Credits
CMMSMMM600	Tissue and cell biology	2 Credits
CMMSMMM601	Structure, organization, and regulation of human genes	1 Credit
CMMSMMM602	PCR and reverse genetics	1 Credit
CMMSMMM603	Introduction to nanomedicine	3 Credits

B. Specialized Courses (Second Semester)

The requirement of specialized courses is 15 credit hours. These courses cover topics specific to Molecular Genetics, Nanomedicine and Molecular Immunology.

Course Code	Course Name	Credit Hours
CMMSPMS605	Genetic testing in genomic era	2 Credits
CMMSPMS606	Genomics, proteomics, and metabolomics	2 Credits
CMMSPMS607	Genomic disorders: phenotype-genotype correlation	2 Credits
CMMSMMM604	Inflammation and allergy	3 Credits
CMMSMMM605	Cellular and molecular immunology	3 Credits
CMMSMMM606	Biological and pharmacological aspects of nanomedicine	3 Credits

C. Diploma Project

Course Code	Course Name	Credit Hours
CMMSMMM607	Diploma Project	4 Credits

D: Master Thesis

Course Code	Course Code	Credit Hours
CMMSMMM609	Master Thesis **(3rd- 4th semesters)**	8 Credits

Methods of Assessment

Student performance in each course will be evaluated based on:

- Student performance including presentations (30%)
- Written assignments (30%)
- Final exam "written and practical" (40%)

Admission Requirements

Minimum requirements to be considered for program admission include:

- The applicant is a citizen of one of the GCC countries or a citizen of an Arab country and is a resident in one of the GCC countries.
- Nomination / no objection letter from the Ministry of Health/ Education or Higher Education of the applicant's country (GCC citizens).
- A medical degree or a bachelor's degree awarded in one of the health sciences or related fields (for example, but not limited to, life sciences, genetics, immunology, bioinformatics, biochemistry, dentistry, or pharmacy) from a university recognized by AGU.
- A minimum overall average of "Very Good" to be considered for the Master of Science and "Good" to be considered for the Diploma.
- General courses in molecular biology or genetics are required.
- General courses in biochemistry, clinical chemistry, analytical biochemistry, biology, and cell biology are recommended.
- Evidence of adequate proficiency in the English language (Minimum TOEFL Score of 500 or IELTS of 5.5). TOEFL Score of 450 or IELTS of 5.0 can be provisionally accepted conditional to reaching the language requirements during the first year in the program.
- Applicants satisfying the minimum requirements must appear for a personal interview.

Graduation Requirements

Master of Science

- Successfully complete 28 Credit Hours of didactic course work.
- Obtain a minimum cumulative GPA of 3.0 out of 4.0.
- Perform a laboratory-based research project and successfully orally defend a written thesis (8 Credit Hours) in front of an appointed faculty committee.

Diploma

- Successfully complete a minimum of 24 Credit Hours of didactic course work.
- Obtain a minimum cumulative GPA of 2.0 out of 4.0.
- Satisfactorily complete a diploma project (4 Credit Hours) approved by the academic committee.

Program Faculty

AGU Faculty

Dr. Abdelhalim Deifalla	Professor, Department of Anatomy
Dr. Afif Ben Saleh	Professor, Department of Family and Community Medicine
Dr. Moiz Bakhiet	Professor, Department of Molecular Medicine
Dr. Khaled Greish	Professor, Department of Molecular Medicine
Dr. Sebastien Taurin	Associate Professor, Department of Molecular Medicine
Dr. Ahmed Jaradat	Associate Professor, Department of Family and Community Medicine
Dr. Mai Sater	Assistant Professor, Department of Biochemistry
Dr. Cristina Skrypnyk	Assistant Professor, Department of Molecular Medicine
Dr. Noureddine Ben Khalaf	Assistant Professor, Department of life sciences
Dr. Deeba Jairajpuri	Assistant Professor, Department of Biochemistry
Dr. Safa Taha	Assistant Professor, Department of Molecular Medicine
Dr. Amina Abdulrahman Yousif	Lecturer, Department of Pathology

Adjunct Faculty

Dr. David Grainger	Professor, Department of Biomedical Engineering and Pharmaceutics and Pharmaceutical Chemistry, University of Utah, USA
Dr. Norfilza Mohd Mokhtar	Professor, Department of Physiology, Faculty of Medicine, National University of Malaysia, Malaysia
Dr. Valeria Pittala	Professor, Department of Drug and Health Sciences, University of Catania, Italy
Dr. Zarina Abdul Latiff	Professor, Thalassemia Centre- Faculty of Medicine, National University of Malaysia, Malaysia
Dr. Fang Jun	Associate Professor, School of Pharmacy, Sojo University, Kumamoto, Japan

Applications

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Information on Program

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