MS. Curriculum in Biomedical Sciences

YEAR I (21 credits)

BIOM 300 Medical Biochemistry	6 credits
BIOM 301 Quantitative Analysis and Biostatistics	2 credits
BIOM 302 Techniques of Scientific Communications	2 credits
BIOM 303 Antimicrobial Chemotherapy and Resistance	3 credits
BIOM 306 Advanced Biochemistry (Enzymology/Metabolism)	3 credits
BIOM 320 Advanced Medical Immunology	3 credits
BIOM 321 Medical Microbiology	3 credits
BIOM 324 Advanced Topics in Infection and Immunity	3 credits
BIOM 325 Techniques in Immunology	1 credit
BIOM 326 Clinical Microbiology and Infection	6 credits
BIOM 327 Infectious Diseases	2 credits
BIOM 330 Advanced Molecular Biology	3 credits
BIOM 331 Medical Genetics	2 credits
BIOM 332 Advanced Topics in Biochemistry	3 credits
BIOM 333 Techniques in Biochemistry	1 credit
BIOM 336 Advanced topic in Genetics	3 credits
BIOM 337 Techniques in Genetics	1 credit
BIOM 338 Advanced Topics in Cell Biology	3 credits

Any course taken from MEDI/MEDII curriculum is equivalent to a graduate course.

YEAR II (9 credits)

BIOM 335 Research Tutorials in Biomedical Sciences	3 credits
BIOM 399 Thesis	6 credits

COURSE DESCRIPTIONS

BIOM 300 Medical Biochemistry **6 Credits**

The Graduate Medical Biochemistry Course is a lecture and discussion course designed for graduate students majoring in Biomedical Sciences whose educational goals require more extensive exposure to biochemistry. The course gives greater emphasis to the medical and physiological implications of biochemistry and to human metabolism and its regulation than a more traditional introductory biochemistry course. Interspersed throughout the course will be a substantial number of medical cases, relating to the current topics of the main lecture series to demonstrate the relevance of biochemistry to health and disease. The course also includes sessions aimed at discussing review articles or original research publications in selected topics of biochemistry.

Prerequisite: Biochemistry (BC 205) or equivalent

BIOM 301 Quantitative analysis and Biostatistics **2 Credits**

The course provides students, in the field of biological and medical sciences, with the statistical tools and skills necessary to organize and summarize data in a meaningful way and to interpret and analyze data intelligently to reach sound understanding of observed biological phenomena. The course emphasizes computer applications for most of the statistical techniques covered, using SPSS statistical software.

BIOM 302 Techniques of Scientific Communications **2 Credits**

The course provides a graduate-level overview of the techniques used for platform, poster and written scientific presentations. After having successfully completed the course, students will be able to form logical arguments, discuss the mission of making scientific presentations aimed at delivering clear and concise messages, dissect and summarize scientific publications, constructively criticize scientific presentations, and draft a scientific proposal. Approaches and criteria for scientific research will be presented.

BIOM 303 Antimicrobial Chemotherapy and Resistance (course with lab component) **3 Credits**

In the first section, this course describes the different classes of antimicrobial agents and their mechanisms of action. In the second part, the course classifies and details the mechanisms of resistance manifested by the most important pathogens.

Phenotypic and genotypic techniques for the identification of these mechanisms are presented, analyzed, and performed where applicable. A final part dealing with antibiotic consumption and its effect of bacterial resistance is discussed.

BIOM 306 Advanced Biochemistry (Enzymology/Metabolism) 3 Credits

This course is a lecture and discussion course designed for graduate students whose educational goals require more extensive exposure to biochemistry. This course provides detailed insights into the mechanisms of catalysis of various classes of enzymes including kinetic analysis, catalytic mechanisms, transition state stabilization and regulation of activity, strategies for active site characterization and regulatory properties. Cellular metabolism of carbohydrates, lipids, amino acids and nucleotides will be studied. This course also introduces the graduate students to critical reading of scientific papers**. Prerequisites:** Principles of Biochemistry (BIOL 251) or equivalent

BIOM 320 Advanced Medical Immunology 3 Credits

The course explores the cellular and humoral components of the immune system, emphasizes the genetic and molecular elements controlling cellular interactions and immune responsiveness, highlights the nature of protective responses to infections and tumors, and provides advanced knowledge of the consequences of abnormal immune regulation or function. The course includes sessions, with student participation, aimed at discussing the state of the art in selected topics on innate immunity and regulatory T cells.

Pre-requisite: BIOL 229 (Immunobiology) or equivalent undergraduate course.

BIOM 321 Medical Microbiology 3 Credits

The course describes the microbial world from a medical perspective. It details bacterial pathogenesis, genetics, treatment, and resistance. The course presents sizeable information on human viruses, viral replication strategies, viral diseases, and treatment. Concise components of the course include parasitic and fungal infection of humans. An advanced element of the course will focus on novel generations of anti- microbial drugs, and on alternative strategies in the management of infections with drug-resistant microbes or in subjects with immune deficiencies.

BIOM 324 Advanced Topics in Infection and Immunity 3 Credits

The course targets intracellular microbial infections with the aim of elaborating on the immunopathogenesis and the immune evasion strategies developed by these microbes. The bacteria to be discussed include Mycobacteria, Listeria, Brucella, Chlamidya and Legionella. The selected protozoa are Leishmania, Plasmodium, Toxoplasma and Trypanosoma whereas retroviruses, hepatoviruses, and herpesviruses will constitute the 3 viral families to be studied. The host-microbe interactions will be a primary component of this course, and students would be required to prepare and present term papers on selected topics.

Pre-requisites: BIOM 320 and BIOM 321 or equivalent graduate courses.

BIOM 325 Techniques in Immunology 1 Credit

The course is aimed to introduce the students to the commonly used immunological techniques including enzyme linked immunosorbent assays, radioimmunoassay, cell activation and cytokine measurement, flow cytometry, and lymphocyte proliferation assays.

BIOM 326 Clinical Microbiology and Infection 6 Credits

This course aims at introducing the students to the microbial world from a medical and clinical perspective. The course covers a selection of the most clinically important bacteria detailing the major bacterial pathogens of humans. The course also covers important area in virology, mycology, and parasitology. The course includes two credits of laboratory advanced techniques in microbiology.

BIOM 327 Infectious Diseases 2 Credits

This course deals with the infectious diseases from a diagnostic and clinical perspective. It offers an advanced knowledge of bacterial, fungal, viral, and parasitic infections from bedside to bench top. The material of the course is arranged by organ system and provides transition for clinical considerations. The course includes lectures and case discussions through which the student will be expected to acquire an in-depth knowledge in the field of clinical and diagnostic microbiology and infectious diseases.

BIOM 330 Advanced Molecular Biology 3 Credits

The course is aimed to provide students with advanced knowledge in (1) understanding biochemical processes fundamental to gene structure and function: DNA replication, transcription, translation, and regulation of gene expression; (2) exploring the techniques and applications recombinant DNA research, and the value of this technology in elucidating the mechanisms of complex genetic control. The course is based on advanced lectures as well as on critical reading and discussion of review articles or original research publications in selected topics of molecular biology.

Pre-requisite: BIOL 285 (Molecular Biology) or equivalent undergraduate course.

BIOM 331 Medical Genetics **2 Credits**

The Medical Genetics Course provides the fundamental concepts of human medical genetics in didactic and small group presentations. This course explores the fundamental concepts in human genetics at the molecular, cellular and clinical levels. It details the principles of classical genetics, biochemistry of nucleic acids, control of gene expression, gene therapy, and investigates recent developments in genetic technology. Students will acquire advanced knowledge of (1) structure and function of genes and the general organization of the human genome; (2) genes and diseases; (3) causes and general pathology of chromosomal abnormalities; (4) the basic genetic foundation upon which treatments might be available. Pre-requisite: BIOL 283 (Genetics) or equivalent undergraduate course.

BIOM 332 Advanced Topics in Biochemistry **3 Credits**

The objective of the course is to highlight various aspects of mitochondrial function and visualize the central role that mitochondrial dysfunction plays in many diseases. The course consists of a series of lectures reviews combined with discussions and presentations by students. Topics presented will cover mitochondrial homeostasis, including mitochondrial DNA, oxidative stress, calcium signaling, apoptosis, aging and energy metabolism.
Pre-requisite: BIOM 300 or equivalent graduate course

BIOM 333 Techniques in Biochemistry **1 Credit**

The course is aimed to introduce the students to fundamentals of biochemical methodology: buffers, spectrophotometry, gel electrophoresis, chromatography, protein determination and purification.

BIOM 336 Advanced Topics in Genetics **3 Credit**

The advanced topics in Genetics course is designed to introduce the students to the different types of genetic testing and their uses. Each of the major subspecialties will be addressed: cytogenetics, molecular genetics, biochemical genetics, clinical genetics, and genetic counseling.
Pre-requisite: BIOM 331 or equivalent graduate course.

BIOM 337 Techniques in Genetics **1 Credit**

The course is aimed to introduce the students to the commonly used Genetics techniques including karyotyping, conventional cytogenetic analysis, fluorescence in situ hybridization (FISH), Southern Hybridization and single gel electrophoresis (Comet) assays.

BIOM 338 Advanced Topics in Cell Biology **3 Credits**

This course offers an advanced, in depth analysis of selected topics in cell biology. Students who successfully complete this course will develop insight into the complexities of cell structure and function, the molecular events that mediate cellular processes, their dynamic properties in living cells and how this contributes to the functioning of the whole organism and its development. The course format will include student-led discussion sessions both providing an overview of a topic as well as focusing on important papers in cell biology. Students will be evaluated on their presentations and participation,

BIOM 335 Research Tutorials in Biomedical Sciences **3 Credits**

The course focuses on the areas pertinent to research conducted by faculty members in the field of Biomedical Sciences.

BIOM 399 Thesis **6 Credits**

A 6 credits hour course in which students conduct original research under staff supervision. The projects center around topics related to physiology, immunology-microbiology, biochemistry and genetics. The Core Laboratory Facility at UOB aims to provide an environment and a facility for research in many diverse biomedical fields. The core provides an infrastructure for research applications in cell and animal model system. The major component of the facility is a Molecular and Cellular Biology which includes Molecular Biology, Protein Chemistry, Flow Cytometry, Bioenergetics and Cell Culture facilities. A core facility in physiological research is also available and is equipped with radioactive isotope detection technologies. After completion of their experimental work, students are expected to write a thesis, and to pass an oral examination by defending their work in front of an independent committee of professors with expertise in the respective research domain of each thesis.