

MEDICINE (FACULTY BASED COURSES)

INTRODUCTION

All medicine graduate programs may require from their students to study the following Faculty Based Courses. These courses may be considered compulsory for some programs and electives for the others.

0500-501	Basic Molecular Biology	(1)
0500-502	Basic Immunology	(1)
0500-503	Research Communication I	(1)
0500-504	Research Communication II	(1)

COURSE DESCRIPTION

0500-501: BASIC MOLECULAR BIOLOGY CR: 1

Nucleic acid structure and functions; DNA analysis by agarose gel and DNA sequencing; DNA Replication: Mechanism, Regulation, Differences between prokaryotic and eukaryotic process; DNA damage, repair and mutagenesis, and diseases associated with defective repair; Transcription mechanisms and processing of primary RNA; The genetic code, protein synthesis and regulation; Restriction and modification enzymes and their importance in molecular biology.

0500-502: BASIC IMMUNOLOGY CR: 1

Introduction to immunity, Innate and acquired immunity, Organs and cells of the immune system, the Major Histocompatibility Complex and its role in antigen presentation, Humoral immunity, antibodies and complement, Cell-mediated immune function T cells and macrophages, Cytokines and their roles in immune responses, Transplantation immunology, immunoprophylaxis and immunotherapy, Autoimmunity and autoimmune diseases, Hypersensitivity

500-503: RESEARH COMMUNICATION I CR: 1

The aim of this course is to improve the student's ability to locate and retrieve information in the library, take effective notes, recognize and manipulate biomedical word roots and affixes of classical origin, write scientific English and communicate effectively in seminars. The course has the following components, which are designated to achieve this aim: Library skills, biomedical terminology, basic information structure, processing and seminar skills.

0500-504: RESEARH COMMUNICATION II CR: 1

This course has its emphasis on improving the student's ability to collect and organize relevant information, and then communicate that information effectively for research reporting purposes, whether as a written report or a seminar presentation. The timing of the course is contrived to oblique the student to present his thesis background and methods in a seminar.

MEDICINE (GENERAL COURSES)**INTRODUCTION**

All Medical graduate programs require the study of one or more of the following courses offered by the **Department of Community Medicine and Behavioral Sciences**.

0510-501	Biostatistics and Computer in Medicine	(2)
0510-502	Advanced Biostatistics	(1)
0510-503	Epidemiology	(1)
0510-504	Radiotracer Methodology in Biological Research	(2)
0510-601	Biostatistical Method in Medical Research	(3)
0510-602	Epidemiology of Infectious Diseases	(3)

COURSE DESCRIPTION**0510-501: BIOSTATISTICS AND COMPUTER IN MEDICINE****CR: 2**

This is a 2 credit hour faculty-required course intended for students joining the graduate M.Sc. program in the Faculty of Medicine, Kuwait University. The course takes into account the fact that enrolled students belong to various backgrounds and hence it includes a diversity of topics to meet their interest. The course is characterized by the inclusion of statistical methods in epidemiology (relative risk, odds ratio to measure the association between diseases and factors, evaluation of diagnostic tests), determination of size of investigations and power, analysis of variance, and design of controlled randomized clinical trials. It also includes multivariate statistical methods such as multiple linear regression and binary multivariable logistic regression. It focuses on concepts, limitations, validity and assumptions underlying these statistical methods.

The course also provides students with knowledge about hardware and software computer technology in addition to the skills of applying the procedures of the SPSS statistical package, and information about computer uses in medicine

(hospital information system, drug information system and computer-assisted diagnoses).

0510-502: ADVANCED BIOSTATISTICS**CR: 1**

Planning of statistical investigation. Controlled comparative studies: Clinical and simple comparative trials, two period cross over design. Analysis of variance. Experimental design. The control of misclassification error. Survivorship tables and life tables. Biological assays: Parallel-line, slope ratio and quantal response. Non-parametric statistics: One-sample run test, Mann-whitney test, Kruskal-Wallis analysis of variance, and Kendall rank correlation.

0510-503: EPIDEMIOLOGY**CR: 1**

Scope of epidemiology, basic measures of frequency, sources of morbidity data, direct and indirect standardization. Planning of an epidemiological investigation, survey planning, variability of measurements, validation and problems in validation, measurement of experimental error, population screening and disease control.

**0510-504: RADIOTRACER METHODOLOGY
IN BIOLOGICAL RESEARCH
CR: 2**

This course provides an introduction to the principles and procedures underlying the use of radioactive isotopes in biological research. The material will be presented at a level requiring only elementary mathematics and the principles and procedures will be illustrated with practical examples drawn from actual laboratory work. The course begins with the materials, and detection and measurement of radiation, and progresses to discussions and illustrations of the applications and problems of radiation measurement and experimental design in biology and medicine and methods used for reduction of radiation exposure. Hazards associated with the use of radioactive material will be discussed. Topics which will be given special emphasis include Gamma and Beta counting of biological samples autoradiography, radiochromatography, use in life science and clinical research, and radiation safety measures.

**0510-601: BIOSTATISTICAL
METHODS IN MEDICAL
RESEARCH
CR: 3 PR: 0510-501 or its equivalent.**

The course primarily aims at equipping students with tools of research. This includes univariate statistical methods update, sampling methods and sample size, experimental design, multivariate

analysis, logistic regression, survival analysis: clinical trials, statistical methods in epidemiology, analysis of matched data and nonparametric statistics. Mann-Whitney, Wilcoxon paired test, Kruskal-Wallis and Spearman rank correlation.

**0510-602: EPIDEMIOLOGY OF
INFECTIOUS DISEASES
CR: 3**

Concepts and definitions, epidemiological models, causality, epidemic process, indices of health and disease, natural history of infectious diseases, contact patterns, measuring infectivity, methods and techniques for studying an infection in the community, time and place clustering, use of routinely collected data, special surveys, surveillance of infectious diseases, field investigation, analysis of an outbreak, seroepidemiology, the effect of bias, confounding and misclassification on the identification of source/reservoir of infection and mode of transmission, statistical techniques often used in infectious disease epidemiology, mathematical models for epidemics, primary and secondary prevention in the infectious disease epidemiology, epidemiology of vaccination, control, elimination and eradication, epidemiology of emerging infections and epidemiology of specific infectious diseases.

MASTER OF SCIENCE MEDICAL BIOCHEMISTRY

INTRODUCTION

The Department of Biochemistry (Faculty of Medicine) offers a Master of Science Program in **Medical Biochemistry**. Only full-time students are admitted to this program. The mission of this program is to educate graduate students with cutting edge concepts and techniques in Medical Biochemistry, through guided learning and research. Research interests in the department involve Biochemical, Molecular Biology and Cell Biology approaches in the areas of purine metabolism, diabetes, oxidative stress, colitis, oncogenes, polypeptides, membrane transport, proteins and enzymes and regulation of gene expression in cancer.

According to the University Council decision dated 4/2/2007, Thesis students admitted with effect from September 2007 are exempted from the comprehensive examination.

PROGRAM REQUIREMENTS

The program requirements are:

33 TOTAL COURSE CREDITS

2 COMPULSORY COLLEGE REQUIREMENTS

0510-501 Biostatistics and Computer in Medicine (2)

20 COMPULSORY (Credits in parenthesis)

0500-501	Basic Molecular Biology	(1)
0540-560	Biochemistry Techniques I	(3)
0540-561	Biochemistry Techniques II	(3)
0540-562	Molecular Biology and Biotechnology	(2)
0540-563	Metabolic Homeostasis and Abnormalities	(3)
0540-564	Biochemistry of Diseases	(3)
2000-501	Scientific Writing and Communication Skills	(3)
2000-503	Ethics and Professionalism	(2)

2 ELECTIVES (2 credits each)

The student should take only one course from the following four elective courses. However, upon approval by the program director, students may take additional elective courses from the courses mentioned below or other graduate program(s) within the faculty or university as extra credits.

0540-501	Biochemistry of Cell Organelles
0540-565	Hormone Biochemistry

- 0540-566 Protein and Enzymes
 0540-567 Membrane Biochemistry and Biophysics

9 COMPULSORY (Thesis)

- 0540-597 (0)
 0540-598 (0)
 2000-599 (9)

COURSE DESCRIPTION

0540-501: BIOCHEMISTRY OF CELL ORGANELLES

CR: 2

Methods and techniques of cell biology. Organization of the cell: cellular organelles and membrane systems/biogenesis/cytoskeletons. Vesicular traffic and cell function. The extracellular matrix, cell-cell junctions and cellular communication. Protein sorting, processing and degradation pathways. The cell cycle: organization, mechanisms and control. Coordination of cell growth and cell division, and biogenesis of organelles. Cell aging and cell death: necrosis and apoptosis.

0540-560: BIOCHEMISTRY TECHNIQUES I

CR: 3

Theories and practicals: Analytical techniques - Spectrometry – UV/VIS and fluorescence; Gel electrophoresis (proteins), Blotting, IEF, activity staining ; Chromatographic methods including HPLC, GC/MS, LC/MS; Radioisotope tracer techniques; Detection of free radical production and free radical-induced damage; Chemiluminescent assay methods, Confocal Microscopy, ELISA. Preparative biochemistry-Protein purification, enzyme assay and characterization.

0540-561: BIOCHEMISTRY TECHNIQUES II

CR: 3

Theories and practicals: DNA and RNA isolation and analysis, plasmid and cloning tools and transformation, DNA sequencing and applications, bioinformatics, genes expression and analysis, small animals handling, induction of diabetes and colitis in animals, recombinant protein expression systems, peptide and oligonucleotides synthesis, radiochemical handling, radioimmunoassay, basic

cell culture, growth media, cell culture, microscope applications, cytogenetic techniques, clinical and research applications,

Theories only: specialized animal models/gene knockout and transgenic animals, specialized techniques, flow cytometry, nanotechnology, fluorescence in situ hybridization, comparative genomic hybridization.

0540-562: MOLECULAR BIOLOGY AND BIOTECHNOLOGY

CR: 2

Nucleic acid structure and functions, human genome structural and functional organization, DNA damage, repair and mutagenesis and diseases, genetic recombination, oncogenesis: oncogenes and tumor suppressor genes, regulation of gene expression, post-transcriptional and post-translational modifications, protein secretion and related diseases, principles and DNA applications of biotechnology, embryonic stem cells, mammalian cloning, transgenic animals: different strategies, yeast hybrid systems and gene therapy with ethical considerations, basic principles, procedures and applications of genetic finger printing in forensic sciences.

0540-563: METABOLIC HOMEOSTASIS AND ABNORMALITIES

CR: 3

Thermodynamics and biological systems; pathways and integration of biochemical processes in the cell. Enzyme activities and control mechanisms in metabolic sequences, including allosteric control, covalent modification and enzyme turnover. Key products, biochemical controls and sequences in selected organ systems. Central role of the liver in metabolic homeostasis. Metabolic states – feeding, fasting, obesity. Metabolic dysregulation.

Nutritional inputs and metabolic homeostasis. Free radicals and cellular defense systems.

0540-564: BIOCHEMISTRY OF DISEASES

CR: 3

Metabolic disorders: Disorders of carbohydrate metabolism; Disorders of amino acid transport; Purine metabolic disorders; Disorders of lipid metabolism; Nutrition abnormalities; Disorders at cell organelle levels. Special topics: Markers for diagnosis; Inflammation; Genetic basis and inheritance of diseases; DNA repair disorders; Neurological disorders; Omics biochemistry for diagnosis.

0540-565: HORMONE BIOCHEMISTRY

CR: 2

Growth hormones and growth disorders; Enzymatic functions and pathways for steroidogenesis; Stress and hypertension; Nuclear receptors and retinoid effects; Non-genomic effects of hormones; Hormones and reproduction; Hormone pollution and disruptors; Hormones and cancer; Hormone disorders in Kuwait.

0540-566: PROTEIN AND ENZYMES

CR: 2

Protein structure and physico-chemical properties. Protein folding and stability; the nature of the native state. Methods for determination of protein structure. Enzyme kinetics and the nature of the active site. Protein and enzyme engineering; synthetic and natural peptides.

0540-567: MEMBRANE BIOCHEMISTRY AND BIOPHYSICS

CR: 2

Membrane composition and function; plasma membrane, intracellular membranes and organelles. Lipid bilayer and 'Fluid Mosaic' model as unifying concepts in study of biomembranes. Microdomains, membrane rafts, membrane fluidity, lipid-protein interactions and roles of membrane-associated enzymes. Interactions of cytoskeleton with membranes. Membrane permeability; carriers and channels. Ion movements and membrane potential.

0540-597: THESIS

CR: 0

0540-598: THESIS

CR: 0

2000-599: THESIS

CR: 9