

Master of Science in Medical Biochemistry
Program code: 054010

INTRODUCTION

The Department of Biochemistry (Faculty of Medicine) offers a Master of Science Program in **Medical Biochemistry**. 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. The program offers only thesis option.

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

31 TOTAL COURSE CREDITS

2 COMPULSORY COLLEGE REQUIREMENTS

0510-501 Biostatistics and Computer in Medicine (2)

20 COMPULSORY (Credits in parenthesis)

0540-521 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)

0 ELECTIVES

The program offers the following elective courses and student may register one or more of these courses 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 COURSES

0540-597 Thesis (0)

0540-598 Thesis (0)

2000-599 Thesis (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