# Doctor of Philosophy in Medical Biochemistry
# Program code: 054070

## *INTRODUCTION*

The Department of Biochemistry (Faculty of Medicine) offers a Ph.D. of Science program in **Medical Biochemistry**. The objective of the program is to have in-depth knowledge in Medical Biochemistry, and to be capable of learning and carrying out independent basic research in area of their choice in a pertinent field of Biomedical research.

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## *PROGRAM REQUIREMENTS*

**33 TOTAL COURSE CREDITS**

**9-15 Course credits in the major specialization (Biochemistry)**

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|---|---|---|
| 0540-601 | Advanced Topics in Cell Biology | (3) |
| 0540-602 | Advanced Medical Nutrition and Nutrigenomics | (3) |
| 0540-603 | Selected Topics in Omics | (1) |
| 0540-604 | Advanced Topics in Protein and Enzyme Biochemistry | (2) |
| 0540-605 | Current Advances in Membrane Biochemistry | (2) |
| 0540-606 | Advanced Topics in Free Radical Biochemistry | (2) |
| 0540-607 | Selected Topics on Catalytic and Small RNA molecules | (1) |
| 0540-608 | Advanced Topics in Protein Secretion | (1) |
| 0540-609 | Advances in Gene Therapy | (1) |
| 0540-610 | Inflammation and Mediators | (1) |
| 0540-611 | Advanced Topics in Molecular Biology-I | (1) |
| 0540-612 | Advanced Topics in Molecular Biology-II | (1) |
| 0540-613 | Research Topic | (2) |
| 0540-614 | Research Communication | (2) |
| 0540-615 | Advanced Techniques in Cytogenetics & Tissue culture | (1) |
| 0540-616 | Advanced Topics in Metabolic Homeostasis | (1) |

**0-6 Courses outside the major specialization**

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|---|---|---|
| 0510-601 | Biostatistical Methods in Medical Research | (3) |
| 0520-519 | Molecular Microbiology | (3) |
| 0520-604 | Advanced Immunology | (3) |
| 0530-566 | Neurophysiology | (3) |
| 0555-502 | Nuclear Medicine Instrumentation | (2) |
| 0560-506 | Tissue and Organ Histology | (2) |
| 0712-530 | Methods in Histology and Histopathology | (2) |
| 2000-501 | Scientific Writing and Communication Skills | (3) |
| 2000-503 | Ethics and Professionalism | (2) |
| 2050-512 | Molecular Medicine | (3) |

## 18 COMPULSORY COURSES

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|---|---|---|
| 0540-697 | Dissertation | (0) |
| 0540-698 | Dissertation | (0) |
| 0540-699 | Dissertation | (18) |

## *COURSE DESCRIPTION*

**0540-601: ADVANCED TOPICS IN CELL BIOLOGY**
**CR: 3**

The course will be organized in five themes:' methods for studying the cell', 'structural organization of the cell and cell-to-cell interactions', 'cell signaling and movements', 'cell cycle, aging, and death', and 'special topics'. References will be given to students prior to the classes; students' participation in discussions are expected. The student's learning will further be strengthened by carrying out a study project with an oral presentation. Students' performance will be assessed by written examinations, participation in discussions and a study project report with an oral presentation.

**0540-602: ADVANCED MEDICAL NUTRITION AND NUTRIGENOMICS**
**CR: 3**

Relevance of nutrition as a therapy in certain diseases including IBD will be discussed. Implications of recent developments in molecular biology in relation to nutrition-responsive genes and human health and diseases, nutrigenomics and personalized nutrition in pregnancy. Students may be asked to present a relevant recent review.

**0540-603: SELECTED TOPICS IN OMICS**
**CR: 1**

Advanced methods used in '-Omic' technology: Probes and limitations, applications in human disease diagnosis and gene identification.

**0540-604: ADVANCED TOPICS IN PROTEIN AND ENZYME BIOCHEMISTRY**
**CR: 2**

Determination of protein structure. Protein folding and the nature of native conformation. Intrinsically disordered proteins. Enzymes and enzyme activity and inhibition. Allosterism and its implications in enzyme regulation and drug development.

**0540-605: CURRENT ADVANCES IN MEMBRANE BIOCHEMISTRY**
**CR: 2**

Current membrane models; nature and roles of membrane microdomains. Membrane permeability and transport pathways for water and solutes; nature, activity and regulation of selected nutrient transporters in health and disease.

**0540-606: ADVANCED TOPICS IN FREE RADICAL BIOCHEMISTRY**
**CR: 2**

Pathways of production and neutralization of ROS and RNS. Role in human pathologies and signal pathways, inflammation and free radicals; mechanism and treatment strategies. The students will select, critically analyze and discuss recent publications in the field of free radical biochemistry.

**0540-607: SELECTED TOPICS ON CATALYTIC AND SMALL RNA MOLECULES**
**CR:1**

Small and micro RNA as regulators of gene expression; roles in human diseases. Structure and synthesis, and applications in gene therapy. Student is expected to make a presentation on a state of the art topic in gene expression regulation by small/micro RNA.

**0540-608: ADVANCED TOPICS IN PROTEIN SECRETION**
**CR: 1**

Protein trafficking and secretory pathways, mechanism and pathologies arising due to defect in protein secretion mechanism.

**0540-609: ADVANCES IN GENE THERAPY**
**CR:1**

Current status of gene therapy of human monogenic and polygenic diseases. Limitations and future hope of Gene therapy.

**0540-610: INFLAMMATION AND MEDIATORS**
**CR: 1**

Mediators of inflammation: basis of immunopathology and therapy targeting various inflammatory targets.

**0540-611: ADVANCED TOPICS IN MOLECULAR BIOLOGY-I**
**CR: 1**

Students will undertake critical review of current model of eukaryotic transcription, perform literature search and present to the department as oral presentation; Diseases related to defect in transcription initiation.

**0540-612: ADVANCED TOPICS IN MOLECULAR BIOLOGY-II**
**CR:1**

Students will perform critical review of current models of eukaryotic translation initiation and regulation, perform literature searches and present to the Department as oral presentation; Diseases related to defects in translation initiation.

**0540-613: RESEARCH TOPIC**
**CR:2**

Student will conduct a literature search on an assigned topic related to his/her prospective thesis research area and present a written report and oral presentation.

**0540-614: RESEARCH COMMUNICATION**
**CR:2**

Student will conduct a literature search on a selected topic and will present a written report and oral presentation.

**0540-615: ADVANCED TECHNIQUES IN CYTOGENETICS & TISSUE CULTURE**
**CR:1**

In this course students will be introduced with FISH, karyotyping, microarray, in-situ genomic hybridization, tissue culture techniques, fluorescence microscopy and confocal microscopy, cell growth and cell cycle, media composition and preparation.

**0540-616: ADVANCED TOPICS IN METABOLIC HOMEOSTASIS**
**CR:1**

In this course student will study advanced topics in metabolic homeostasis related to human health and diseases in various organs including diabetes and medical trauma.

**0540-697: DISSERTATION**
**CR: 0**

**0540-698: DISSERTATION**
**CR: 0**

**0540-699: DISSERTATION**
**CR: 18**