

## **Master of Science in Biochemistry**

### **Program code: 049040**

#### ***INTRODUCTION***

The Department of Biological Sciences (College of Science) offers a Master of Science program in **Biochemistry**. Research requirements include either thesis or non-thesis options. The program is designed to allow students to expand their general exposure to Biochemistry and to deepen their expertise in a particular area of Biochemistry together with other fields of sciences related to it. With these objectives in mind, students enroll in both general and specialized courses in Biochemistry. Research for the M.Sc. degree is possible in any of the areas in which graduate faculty members have active research programs.

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

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#### ***PROGRAM REQUIREMENTS*** (non-thesis option in parenthesis)

##### **30 (33) TOTAL COURSE CREDITS**

##### **7 (10) COMPULSORY COURSES (credits in parenthesis)**

|          |                                      |     |
|----------|--------------------------------------|-----|
| 0496-511 | Advanced Biochemistry I              | (3) |
| 0496-532 | Advanced Biochemistry II             | (3) |
| 0496-554 | Seminar                              | (1) |
| 0496-593 | Project (for non-thesis option only) | (3) |

##### **4-6 PRACTICAL ELECTIVE COURSES (2 credits each)**

|          |                       |
|----------|-----------------------|
| 0496-521 | Modern Techniques I   |
| 0496-522 | Modern Techniques II  |
| 0496-523 | Modern Techniques III |

##### **8-10 (17-19) ELECTIVES COURSES\* (credits in parenthesis)**

|          |                                      |     |
|----------|--------------------------------------|-----|
| 0480-585 | Statistical Methods in Research      | (3) |
| 0496-542 | Natural Products                     | (2) |
| 0496-543 | Nutrition                            | (2) |
| 0496-544 | Proteins/Peptides                    | (2) |
| 0496-545 | Clinical Biochemistry                | (2) |
| 0496-546 | Enzymes                              | (2) |
| 0496-547 | Molecular Biology                    | (2) |
| 0496-549 | Photosynthesis                       | (2) |
| 0496-550 | Mycotoxins in Environment and Cancer | (2) |
| 0496-552 | Biochemical Pharmacology             | (2) |

|          |                           |     |
|----------|---------------------------|-----|
| 0496-553 | Biochemical Endocrinology | (2) |
| 0496-555 | Environmental Science     | (2) |
| 0496-556 | Radiation Biochemistry    | (2) |

Exemption of Master of Biochemistry students from elective courses and replacement with theoretical elective courses from the level of 500 outside the program or the level of 400 within the Department of Biological Sciences or the Faculty of Medicine with the approval of the student supervisor.

## 9 COMPULSORY COURSES

|          |        |     |
|----------|--------|-----|
| 0496-597 | Thesis | (0) |
| 0496-598 | Thesis | (0) |
| 2000-599 | Thesis | (9) |

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## COURSE DESCRIPTION

### 0496-511: ADVANCED BIOCHEMISTRY I CR: 3

Bioenergetics; role and control of macromolecular structures in biological system.

### 0496-521: MODERN TECHNIQUES I CR: 2

Spectrophotometry: Spectroscopic study as applied to the elucidation of molecular structures is given in detail. A comprehensive theoretical description of infrared, mass spectrometry and proton/carbon/Nitrogen NMR is introduced. This is followed by interpretation of actual spectra of known compounds. A number of problems are dealt with to enable the students to deal with spectral data of unknown compounds.

### 0496-522: MODERN TECHNIQUES II CR: 2 PR:0496-521

Separation methods: Separation techniques such as various analytical and preparative chromatographic methods, size exclusion chromatography, gas chromatography, high performance liquid chromatography, gas filtration. Theoretical description of these separation methods is followed by a practical demonstration of the respective techniques in the isolation of various types of molecules.

### 0496-523: MODERN TECHNIQUES III CR: 2 PR:0496-521

Radioisotopic methods: The course deals with the use and possible application of isotopes in biology: (a) and their use to study the fate of a given compound in an organism or biological process; (b) as internal standards for measuring the efficiency of extraction of compounds from biological material and (c) in the determination of extremely low amounts of biologically important compounds by radioimmunological assay. A number of problems are dealt with, to show how to calculate the decay rates, carrier dilution double label analyses and biological half-life.

### 0496-532: ADVANCED BIOCHEMISTRY II CR: 3 PR:0496-511

Biochemistry of cellular organelles; regulation of metabolism under different physiological conditions and in specific tissues.

### 0496-542: NATURAL PRODUCTS CR: 2

Biosynthetic pathways of secondary metabolites elaborated by microbes and higher plants. A detailed discussion of major biosynthetic pathways such as acetate/malonate, shikimate and isopropanoid pathways is introduced. Biosynthesis, biological activity and ecological significance of various classes of natural products are given. Most of these classes of secondary

metabolites are considered according to the basic 'building blocks' from which they are derived.

**0496-543: NUTRITION**

**CR: 2**

Recent advances in the mode of action of vitamins and minerals; nutritional requirements of various developmental stages; in normal and abnormal conditions; nutritional interaction with food toxicants and environmental contaminants.

**0496-544: PROTEINS/PEPTIDES**

**CR: 2**

Amino acids and their metabolic and structural relationships. Peptide specificities, protein structure, protein function, protein's structure-function relationships. Biochemical basis of proteins as catalysts. Activation and inhibition of enzymes. Proteins as control of metabolism. Examples of conjugated proteins, nucleoproteins, membrane proteins and fibrous proteins.

**0496-545: CLINICAL BIOCHEMISTRY**

**CR: 2**

Disturbances in metabolism, endocrine glands, blood coagulation, and immune response. The clinical significance of these disturbances, and the chemical tests for diagnosis.

**0496-546: ENZYMES**

**CR: 2**

Mechanism of action and catalysis of some enzymes. Kinetics of unireactant and bireactant systems.

**0496-547: MOLECULAR BIOLOGY**

**CR: 2**

Current state of knowledge of the rapidly expanding science of genetic engineering.

**0496-549: PHOTOSYNTHESIS**

**CR: 2**

Introduction to the photosynthetic process, light as the driving force of photosynthesis, light harvesting and energy capture in photosynthesis, architecture of the photosynthetic apparatus, electron and proton transport, synthesis of ATP: photophosphorylation and chemistry of photosynthesis.

**0496-550: MYCOTOXINS IN ENVIRONMENT AND CANCER**

**CR: 2**

Biochemistry of microorganism together with biosynthesis and biochemical effects on living systems. Methods of control, decontamination and analysis in agricultural and animal products are discussed. Environmental aspects and toxicology of cancerous mycotoxins .

**0496-552: BIOCHEMICAL PHARMACOLOGY**

**CR: 2**

Introduction to pharmacology. Clinical use of drugs, mechanisms of drug action, administration and absorption of drugs, distribution of drugs to tissues, quantitative aspects of drug action, termination of drug action, drug metabolism, drug toxicity, aspects of drug abuse and dependence, development and evaluation of new drugs.

**0496-553: BIOCHEMICAL ENDOCRINOLOGY**

**CR: 2**

Mechanisms of hormone secretion, action and response, prostaglandins and cyclic nucleotides, hormones and the brain, interaction of the hypothalamus and pituitary glands in hormonal regulation, coordinated control of fuel metabolism by hormones, steroid hormones, other hormones and their effects.

**0496-554: SEMINAR**

**CR: 1 PR: 0496-511/Approval of the department**

The student presents a review of an advanced topic in biochemistry to the department, after detailed library search.

**0496-555: ENVIRONMENTAL SCIENCE**

**CR: 2**

Basic principles of ecology as the foundation upon which all environmental problem-solving is based. Another purpose is to illuminate the world's most important environmental problems and to describe the pros and cons of possible solution to these problems.

**0496-556: RADIATION BIOCHEMISTRY**

**CR: 2**

Late effects of ionizing radiation in organized living systems, in general and the human beings in particular.

**0496-593: PROJECT**

**CR: 3**

The student undertakes an independent project on a research topic of theoretical and/or experimental focus under the supervision of a faculty member listed in the supervisory list of the College of Graduate Studies. The objective is to provide the student with an opportunity to integrate and apply the knowledge gained throughout the course of study in a practical problem. The student must document the project in a scientific report following standard research writing guidelines and give a public presentation to the project examination committee.

**0496-597: THESIS**

**CR: 0**

**0496-598: THESIS**

**CR: 0**

**2000-599: THESIS**

**CR: 9**