

B.Sc. in Biotechnology & Genetic Engineering

Study Plan

▪ **University Compulsory Courses** **16 C.H**
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▪ **University Elective Courses** **9 C.H**
Pages (64 & 65)

▪ **Faculty Compulsory Courses** **19 C.H**

Line No.	Code	Course	
901010	MATH101	CALCULUS(I)	3
901021	MATH102A	CALCULUS(FOR BIO.SCI.STUDENTS)	3
901310	MATH131	ELEMENTS OF STATISTICS	3
921012	PHY101B	GENERAL PHYSICS(1)	3
921022	PHY102B	GENERAL PHYSICS (2)	3
921072	PHY107B	GENERAL PHYSICS (LAB)	1
1721150	CS115	C++ PROGRAMMING .	3

▪ **Department Compulsory Courses** **75 C.H**

Line No.	Code	Course	
102222	MED222B	BIOCHEMISTRY	3
911010	CHEM101	GENERAL CHEMISTRY(1)	3
911020	CHEM102	GENERAL CHEMISTRY (2)	3
911072	CHEM107B	GENERAL CHEMISTRY LAB	1
912170	CHEM217	ORGANIC CHEMISTRY	3
912330	CHEM233	ANALYTICAL CHEMISTRY	3
912340	CHEM234	ANALYTICAL CHEMISTRY LAB.	1
931010	BIO101	GENERAL BIOLOGY (1)	3
931020	BIO102	GENERAL BIOLOGY (2)	3
931070	BIO107	GENERAL BIOLOGY (PRACTICAL)	1
932510	BIO251	CELL BIOLOGY	3
933311	BIO331A	GENERAL MICROBIOLOGY	3
933322	BIO332B	GENERAL MICROBIOLOGY (LABORATORY)	1
933331	BIO333A	IMMUNOLOGY & SEROLOGY	3
933360	BIO336	IMMUNOLOGY & SEROLOGY (LABORATORY)	1
933413	BIO341C	MOLECULAR GENETICS	3
933440	BIO344	MOLECULAR GENETIC (LAB)	1
933520	BIO352	BIOCHEMISTRY (LAB)	1
962320	BT232	BASIC BIOTECHNOLOGY	2
963010	BT301	BIO-COMPUTING	1
963630	BT363	TISSUE CULTURE AND HYBRIDOMA TECHNOLOGY	2
963631	BT363A	TISSUE CULTURE AND HYBRIDOMA TECHNOLOGY (LAB)	0
963990	BT399	FIELD TRAINING	3
964111	BT411	ANIMAL BIOTECHNOLOGY	2
964210	BT421	PLANT BIOTECHNOLOGY	3
964211	BT421A	PLANT BIOTECHNOLOGY (LAB)	0
964310	BT431	MICROBIAL BIOTECHNOLOGY	3
964311	BT431A	MICROBIAL BIOTECHNOLOGY (LAB)	0
964370	BT437	PHARMACEUTICAL BIOTECHNOLOGY	3
964410	BT441	HUMAN GENETICS	3
964510	BT451	MOLECULAR BIOLOGY (1)	3

964520	BT452	PROTEIN BIOTECHNOLOGY	3
964521	BT452A	PROTEIN BIOTECHNOLOGY (LAB)	0
964530	BT453	MOLECULAR BIOLOGY (LAB)	1
964540	BT454	MOLECULAR BIOLOGY (2)	2
964560	BT456	CYTOGENETICS	3
964561	BT456A	CYTOGENETICS (LAB)	0
964910	BT491	SEMINAR	1

▪ **Department Elective Courses** **11C.H**

Line No.	Code	Course	
173210	LM321	CLINICAL BIOCHEMISTRY (1)	4
173510	LM351	HEMATOLOGY	4
173512	LM351	HEMATOLOGY (LAB)	0
933340	BIO334	DIAGNOSTICS BACTERIOLOGY	4
933341	BIO334A	DIGNOSTICS BACTERIOLOGY (LAB)	0
934110	BIO411	DEVELOPMENTAL BIOLOGY	3
934321	BIO432A	VIROLOGY	3
934322	BIO432H	VIROLOGY (LAB)	0
963520	BT352	CELLULAR SIGNALING	3
963720	BT372	MODERN TECHNIQUES IN BIOTECHNOLOGY	2
963721	BT372A	MODERN TECHNIQUES IN BIOTECHNOLOGY (LAB)	0
963910	BT391	SCIENTIFIC WRITING AND PRESENTATION	1
964320	BT432	MICROBIAL MOLECULAR BIOLOGY	3
964360	BT436	ENVIRONMENTAL BIOTECHNOLOGY	3
964361	BT436A	ENVIRONMENTAL BIOTECHNOLOGY (LAB)	0
964420	BT442	POPULATIONS OF BIOTECHNOLOGY IN MEDICINE	3
964550	BT455	APPLICATIONS OF BIOTECHNOLOGY IN MEDICINE	3
964920	BT492A	SELECTED TOPICS IN BIOTECHNOLOGY (A)	3
964921	BT492B	SELECTED TOPICS IN BIOTECHNOLOGY (B)	2
964922	BT492C	SELECTED TOPICS IN BIOTECHNOLOGY (C)	1
964930	BT493	PROJECT	3
964950	BT495	LABORATORY MANAGEMENT	1
964960	BT496	ETHICAL ASPECTS OF BIOTECHNOLOGY	1

TOTAL **130 C.H**

*** For prerequisite & equivalent courses see the Courses' Description.**

B.Sc. in Biotechnology and Genetic Engineering

Courses' Description

BT 232 Basic Biotechnology (2) (2 C.H: 2 lectures) Prerequisite BIO 102.

This class discusses the fundamental aspects of biotechnology and its importance to mankind in a concise and lucid explanation of this newly founded science. The course emphasizes how cell structure and function is a vital starting point for knowledge of genetic engineering and gene technology. Lectures will underlie the principles and application of Recombinant DNA technology in industrial, agricultural, pharmaceutical, and biomedical fields.

BT 301 Bio-computing (1) (3 H Practical)

This course will introduce students to some of the most commonly used software packages for genetic analysis of nucleic acid, protein sequences and designing primers for PCR. In addition the class explores and explains some of the computational biology tools found on the Internet and how they can be applied to problems in genomic and molecular biology. *Prerequisite CIS 100 + BIO 341.*

BT 352 Cellular Signaling (3) (3 C.H., 3 lectures)

Discusses the roles of cell architecture and the molecular mechanism, which can be used by cells to signal each other's. Topics including G-protein, Kinases, Phosphatases, c-AMP, and signal transduction cascades invokes by Insulin. *Prerequisite BIO 351.*

BT 363 Tissue Culture and Hybridoma Technology (2) (2 C.H., 1 lecture & 3 practical).

Students will learn how to establish and maintenance primary cell lines from different recourses such as chick embryos, carcinoma tissues and myoblast. In addition the students will learn how to transform these cell lines with reporter genes constructs in their Graduation projects. The other part of the course will introduce the students to basic hybridoma technology concepts and monoclonal antibodies production techniques and the necessary assays used in monoclonal antibody characterization. *Prerequisite BIO 331 and BIO 333.*

BT 372 Modern Techniques in Biotechnology(2) 2C.H (1 lecture & 3 practical)

This course will cover most up-to-date techniques essential for genetic engineering experiments. In addition a detailed explanation of protocols required for isolation, cloning and expression of genes will be discussed. *Prerequisite BIO 351+ BIO 352*

BT 391 Scientific Writing and Presentation (1) 1 C.H (1 lecture)

This class outlines the basic requirements for science essay and technical report writing and covers the tools of writing (references, using illustrations). Prepare the students how to write a CV and letters for job application. *Prerequisite BT 232.*

BT 399 Field Training 3 CH

This course is a field training where the students chose a research institution, central laboratories, hospital laboratories or any other center for their summer training. Student should finish about 2 months of the training in fields related to biotechnology and genetic engineering, after which they should provide an evaluation from their trainers to the department to pass the courses. *Prerequisite, successfully completing 90 CH*

BT 411 Animal Biotechnology (2) 2 C.H (2 lectures)

The course covers topics such as : Transgenic animals and their applications; In vitro fertilization and embryo transfer; cloning and its potential applications as well as other reproductive technologies. *Prerequisite BT 232.*

BT 421 Plant Biotechnology (3) 3 C.H (2 lecture & 3 practical)

This class designed to provide students with up-to-date ways to develop higher-yield and more nutritious crop varieties, to improve resistance to disease, or to reduce the need for inputs of fertilizers and other expensive agricultural chemicals. *Prerequisite BT 232.*

BT 431 Microbial Biotechnology (3) 3 C.H (2 lectures and 3 practical)

This course traces the development of modern biotechnology from its origins in traditional fermentation processes to strain selection and development of recombinant microbes for industrial applications. Industrial microorganisms, substrate for industrial fermentation, methods of fermentation, product recovery, cell immobilization, and commercial exploitation of industrial microorganisms to produce beer, wine, organic acids, amino acids, enzymes, vitamins, antibiotics and single cell protein will be emphasized. *Prerequisite BIO 331*

BT 432 Microbial Genetics (3) 3 C.H (2 lectures and 3 practical)

This course introduces the subject of bacterial genetics using molecular biology approaches. It explains a wide range of bacterial molecular genetics concepts, including recent developments and application in microbial genetic engineering, prokaryotic gene structure and function; DNA replication; gene transfer; regulation of gene expression; genetics of bacteriophages and other viruses, extra-chromosomal inheritance; movable genes; strain development and gene cloning. *Prerequisite BIO 331 + BIO 341.*

BT 436 Environmental Biotechnology (3) 3 C.H (2 Lec and 3 Practical)

The specific application of molecular biology and metabolic capability of microorganisms for exploitation of many areas of biotechnology to reverse and prevent environmental problems. Topics will cover: Environmental monitoring, Sewage treatment, pollution control of domestic, agricultural and industrial wastes, bioremediation and clean technology, energy and biofuels, and mineral resource recovery. *Prerequisite BIO 331 + BT 232*

BT 437 Pharmaceutical Biotechnology (3) 3 C.H (2 lectures and 3 practical)

Introduces the principles of some of the Biotechnology methods used successfully in production of sufficient amount of proteins for clinical trial testing. Specific examples will be emphasized such as lymphokines, growth factors, peptide hormones and blood proteins. *Prerequisite BT 232 + BIO 341*

BT 441 Human Genetics (3) (3 C.H., 3 lectures)

The course covers topics in human genetics such as: Human genetic diseases, mapping the human genome; the molecular analysis of single gene disorders; the genetic analysis of complex diseases; gene therapy, gene testing; the human genome project; human population genetics and evolution; DNA fingerprinting; human genetics and society. *Prerequisite BIO 341*

BT 442. Population Genetics, (3) (3 C.H, 3 Lectures)

Introduction to classical and molecular population genetics, evolution, and phylogenetics. The mathematical models for the effects of mutation, recombination, selection, isolation, and migration on population genetic variation and structure are introduced, with the conceptual aspects of the models emphasized. The use of present population variation for the reconstruction of population history, demography and phylogeny is presented. The relevance for medicine, epidemiology, agriculture, conservation, genomics, forensics, and other applications is also discussed. This course presupposes knowledge of elementary statistics and genetics. *Prerequisite* BIO 341

BT 451 Molecular Biology I (three lectures) 3C.H

Molecular structure of the genetic material. Transcription and translation. Methods of cell therapy of defects in genetic material and mutations. *Prerequisite* BIO 341

BT 452 Protein Biotechnology (3) (2 lecture & 3 practical) 3 C.H

This course covers basic biochemical principles along with a comprehensive survey of products currently available or under development by the biotechnology industry. The scope of protein biotechnology; protein sources; downstream processing of protein products; therapeutic proteins (blood products, vaccines, monoclonal antibodies and related substances, hormones, regulatory factors and enzymes, proteins employed for diagnostic purposes) and polymer degrading enzymes of industrial significance will be emphasized. *Prerequisite* B 351 + BT 451.

BT 453 Molecular Biology Laboratory (3 practical) 1 C.H

Provides comprehensive coverage of the various types of DNA testing currently used in molecular biology laboratories. Students will have hands-on experience with the analytical equipment employed in molecular biology laboratories and the techniques involved in these experiments. *Prerequisite* BT 451 or Cor

BT 454 Molecular Biology II (two lectures) 2C.H

This course will discuss the following concepts: Recombinant DNA technology, explanation of molecular research procedures. Manipulation of gene expression in prokaryotes, heterologous protein production in prokaryotic cells. Molecular diagnostics, genetic engineering in plants. Development and use of transgenic animals and human somatic cell gene therapy. *Prerequisite* BT 451 + BT 453

BT 455 Applications of Biotechnology (3) (3 C.H in Medicine)

The aim of this course is to study a full spectrum of genetic diseases such as Thalassaemia, sickle cell anemia, infectious diseases and diabetes by using the entire array of molecular genetic techniques. In addition the student will be exposed to genetic counseling training. Forensic cases from a real crime seen will be studied. *Prerequisite* BIO 341.

BT 456 Cytogenetics. (3) 3 C. H (2 lectures and 3 practical)

The course provides a comprehensive approach to the normal human karyotype, chromosome identification methods, numerical and structural abnormalities and their clinical correlates, X-chromosome gene action, chromosomes and cancer, human population cytogenetics, and gene mapping. *Prerequisite* BIO 341

BT 491 Seminar (1) (1 lecture) 1 C.H

Both the student and the lecturer agree on a breaking news topic in biotechnology to be presented in an acceptable form of a scientific presentation. *Prerequisite* (Passing 90 C.H)

BT 492. Special Topics in Biotechnology (A, B, C) (3, 2, 1 C.H)

Normally, this course will be based on the development of biotechnology issues. An approved topic should be original and make a contribution to the body of knowledge in the field of biotechnology and genetic engineering. *Prerequisite: Finish 90 C.H*

BT 493 Project (3) (3 C.H., 6 hrs/week)

A well-defined problem is assigned to the student in order to carry out experimental work to be presented in an acceptable form of a scientific report. *Prerequisite* (Finish 90 C.H. Successfully and GPA more than 70%).

BT 495 Laboratory Management (1) (1 Lecture) 1 C.H

This course aims to introduce the student to concepts dealing with laboratory management, such concepts include quality assurance and quality control. Also, the course will include discussions of how to deal with safety and disposal issues for biohazardous materials, environmental toxins as well as radioactive material management. *Prerequisite* (finish 90 C.H)

BT 496 Ethical Aspects of Biotechnology (1) (1 lecture) 1 C.H

This course will discuss the regulatory challenges of the rapid advances in genetic engineering. Moral, religious, legislation and public perspectives regard the human cloning will be emphasize. *Prerequisite* BT 232