الكيمياء الحيوية
Biochemistry
كلية العلوم
Faculty of Science

PhD in Biochemistry

(By coursework and thesis)

Requirements for obtaining a PhD degree in biochemistry:

To obtain a PhD degree in biochemistry, the student must complete at least (42) accredited units, including the PhD thesis. The Units are distributed as follows:

A. (12) accredited units for compulsory courses.
B. (10) units of accredited elective courses.
C. (20) credit hours for master's thesis.

The following is a breakdown of the materials:

A- Compulsory academic Courses (8) Accredited Units:

Course ID	Course Name	Units
BIOC 700	Molecular Physiology	2
BIOC 701	Signal-Transduction Pathways	2
BIOC 702	Physical Biochemistry	2
BIOC 703	Laboratory Rotation	3
BIOC 794	Research Methodology	2
BIOC 795	Biochemistry Seminars	1

B- Elective academic courses (16) credit hours:

Under the guidance of the supervisor and the approval of the department head, the student selects a total of (16) accredited units from the following elective courses.

Course ID	Course Name	Units
BIOC 710	Biochemistry and Molecular Biology Panel Discussions	2
BIOC 720	Mechanism of Biochemical Reactions	2
BIOC 721	Membrane Structures and Transport Processes	2
BIOC 722	Biophysics	2
BIOC 730	Cell Dynamics and Function	2
BIOC 751	Molecular Biology of Cancer	3
BIOC 752	Biochemical Pharmacology	2
BIOC 760	Plant Biochemistry	2
BIOC 761	Recombinant DNA and Gene Cloning	2
BIOC 762	Molecular Basis of Human Diseases	2
BIOC 763	Neurochemistry	3
BIOC 770	Biochemical Responses to Environmental Stress	3
BIOC 780	Bioinformatics and Proteins & Genes structures	2
BIOC 796	Special Topics in Biochemistry	2
BIOC 797	Special Topics in Molecular Biology	2

C - Thesis (10) credit hours:

Course ID	Course Name	Units
BIOC 799	PhD Thesis	20

Course No.	Course Title
	A- Compulsory Courses: (12 units)
BIOC 700	This course aim to study the molecular basis of organs and tissues functions. The topics covered include: Multicellular organisms versus single cell organisms-cell differentiation-Tissues-Organs-Systems-Gastrointestinal physiology-Renal physiology-Respiratory physiology-Muscle contraction.
BIOC 701	This course centres on the communication or signal transduction (S.T.) between cells and tissues. The topics covered include phases of signal transduction (intercellular and intracellular signal transduction) – Ligand – Gated ion channel receptors – Enzyme – Linked receptors – Cytokine receptors – G - Protein – coupled receptors – Cyclic AMP and Cyclic GMP based signal transduction – Calciumbased signal transduction – Phospholipid- based signal transduction – Integration of signal transduction.
BIOC 702	The object of this course is the application of physical chemistry approaches to the study of biological problems. This course concerns the principles and application of classical and statistical thermodynamics, spectroscopy, kinetics and x-ray crystallography to the study of biomacromolecules and biochemical systems.
BIOC 703	The purposes of this course are two-fold (1) development of independency for the student to choose and carry out research, and (2) to operate different bioinstruments. This course includes two, seven-week rotation per semester during the 1st and 2nd semester of the first year. At the end of each rotation, student give short presentation on their projects to the other first year students, the instructor in charge and any other faculty and student who wish to attend. In addition each student prepare a short written report.
BIOC 794	
BIOC 795	Discussion of current research in Biochemistry
	B- Elective Courses: (10 units)
BIOC 710	The objective of this once-a-week course is to assist students in learning the techniques of and formal scientific presentation, and to foster the spirit of scientific exchange. This course includes a series of colloquia offered by program faculty, students and occasional guest lectures, which covered the different field of interest to PhD students and recent advances in biochemistry research.
BIOC 720	The object of this course is the study the mechanism of biochemical Reactions. Topics covered include elementary reactions and mechanisms -Activation parameter ($\Delta G^{\ddagger}$, $\Delta H^{\ddagger}$, $\Delta S^{\ddagger}$)- Rate of reaction and mechanisms- Methods of studying reaction mechanisms (radioisotopes, spectroscopy) - Types of reactions found in biological systems- General acid-base catalysis- Nucleophilic and electrophilic catalysis- Metal ion catalysis- protein transfere- Addition and elimination redox reaction- stereospecific of enzyme catalyzed reaction- practical measurement of rates of fast reaction and analysis of kinetic data.
BIOC 721	The object of this course is the study the structure and function of biological membranes. Topics covered include: Molecular components of biological membranes- Interaction between membrane components – membrane mediated processes- membrane transport-membrane channels- membrane transporter- passive transport- active transport- ionophores
BIOC 722	The object of this course is the application of physics to study biological problems. The topics covered will include the chemical binding- Energies, Forces and bonds-Biological energy (consumption, respiration and photosynthesis)- Thermal conduction-Exitable membranes- Nerve signals- Momery- Ionizing radiation.
BIOC 730	This course centres on the molecular basis of cell structure and functions. The topics covered will include cell properties (reproduction, molecular organization,

	dynamics and integration)- The components, assembly, metabolism and evolution of cellular structures-Interaction of cells with each other and with the environment.
BIOC 751	This course aims to study cancer at the molecular and cellular level. Topics include cell out of control (cancers)- Transformed cells related to cancer cells- Environmental factors and the incidence of cancers- Genetically recessive mutation in some tumors- oncogenes and tumor - Causing viruses- Retroviral- associated oncogenes.
BIOC 752	This course centers on the fundamentals of basic and clinical pharmacology. The topics covered include pharmacological and biochemical basis of drug absorption, distribution, biotransformation, toxicity and susceptibility- key principles of drug action- cellular resistance to antibacterial and anticancer drugs- Drug-drug interaction.
BIOC 760	The object of this course is the study of biochemistry unique to photosynthetic organisms. Topics covered include conversion of light energy to chemical energy by photosystems- carbon fixation- nitrogen fixation- cell walls- vacuoles- plant hormones- plant secondary metabolites and their ecological and medicinal roles. Cell and tissue cultures.
BIOC 761	This course centers on DNA structure, Manipulation and gene cloning and their applications. Topics covered include structure of DNA- Reproducing DNA-Gene expression- plasmids and phages- cutting and joining DNA Hyperidization, probes and amplification using PCR - cloning genes- using cloned genes- AIDS and gene delivery- cancer genes- Application of human genetics (Genetic testing, gene therapy and finger printing).
BIOC 762	This course is designed to study biochemical principles and concepts relevant to understanding the bases of specific human diseases. The topics covered will deal primary with defects in (1) signal transduction e.g. in cancer and diabetes (2) protein folding and turnover e.g. in lysosomal storage or aging-related diseases and (3) metabolism, e.g. diseases of amino acid metabolism, bleeding disorders, and of the cardiovascular system.
BIOC 763	The object of this course is the study of the structure, function, organization and chemistry of the nervous system. Topics covered include: The central nervous system (CNS)- The peripheral nervous system (PNS)- function of the nervous system (sensory function, integrative functions, and motor functions)- organization of nervous system- Neurotransmission- Action potentials- synaptic transmission- neurotransmitter- nerve impulse processing and integrations.
BIOC 770	The object of this course is the study the biochemistry under different types of environmental stress. Topics covered include: environmental stress (pollution, heat shock, low temperature, freezing, salinity and drought)- Biochemistry of microorganisms under low temperature, freezing- Biochemistry of plant under drought, salinity and heat shock- Biochemistry of human under the condition of heat chock, drinking salinity water and electromagnetic radiation.
BIOC 780	The object of this course is the application of computing concepts and mathematical modeling to study the biological information in the form of molecular sequences and structures. Topics covered include: Math primer (probability, combinatorial, optimization, entropy)- computational techniques for finding information in biological sequence, genome and molecular databases- structure prediction (RNA, DNA, proteins)- molecular structure and biochemical properties.
BIOC 796	Recent advances in selected areas of biochemistry will be presented.
BIOC 797	Lecture dealing with specialized topics or recent advances in the field of molecular biology will be presented.
BIOC 799	Ph.D. Thesis