School	Arts and Sciences
Major	Bachelor of Science in Biochemistry

Course Descriptions

Code	Title	Description
BIOL160	Freshman Biology II	This course introduces the fundamental principles of biology, including the characteristics of life, evolution, and the scientific method. It examines the structure and functions of prokaryotic and eukaryotic cells, with emphasis on cell membranes, cellular transport, and cellular organization. The course explores cellular energy transformations, enzyme-mediated reactions, and photosynthesis. It also examines mitosis and meiosis, their stages, outcomes, and significance in growth, reproduction, and genetic variation. The course concludes with an introduction to human physiology, focusing on homeostasis, body organization, circulation, respiration, and digestion, and how these systems work together to maintain life.
CHEM160	Freshman Chemistry II	This course introduces the fundamental principles of chemistry. It covers atomic structure, the classification of atoms and ions, and the naming of chemical compounds. Students apply stoichiometry to chemical reactions. They determine enthalpy changes through thermochemistry. They also examine precipitation, acid–base, and redox reactions in aqueous solutions, including concentration and titrations. The course concludes with chemical equilibrium and Le Châtelier's principle. Emphasis is placed on quantitative problem-solving throughout.
BIOC250	Biochemistry I (General)	This course examines the relationship between protein structure and function, enzyme kinetics and inhibition, and the central pathways of energy metabolism, including glycolysis, gluconeogenesis, glycogen metabolism, the citric acid cycle, fatty acid oxidation, ketone-body metabolism, and amino acid catabolism with the urea cycle. Emphasis is placed on pathway regulation and on inherited metabolic disorders and their clinical relevance.
BIOL200	General Biology I	General Biology I introduces the fundamental principles of biology, with emphasis on the chemical characteristics and biological roles of carbohydrates, lipids, proteins, and nucleic acids and their relevance to everyday-life situations. It examines the structural organization and functions of prokaryotic and eukaryotic cells, mechanisms of transport across biological membranes, and enzyme function and regulation in cellular metabolism, including aerobic respiration. The course also explores the structures and biological roles of nucleic acids, with emphasis on their involvement in the regulation of gene expression.
BIOL200L	General Biology I Lab	General Biology I Laboratory develops fundamental competencies in biological laboratory practice through hands-on investigations. The course emphasizes safe and responsible laboratory practices, appropriate use of laboratory techniques, interpretation of experimental observations and data, and examination of fundamental biological structures and processes. Students also develop scientific communication skills through the presentation of laboratory procedures, results, and conclusions using appropriate biological terminology.
BIOL275	Cell and Molecular Biology	This course provides an overview of fundamental principles and concepts in cell and molecular biology. It focuses on the structure, organization, and functions of cellular components, with particular emphasis on the endomembrane system and the mechanisms involved in intracellular trafficking. The course also explores cell–cell and cell–environment interactions, cellular communication and signaling, and the role of the cytoskeleton in maintaining cellular structure and mediating cellular processes. Current experimental techniques and approaches used in cell and molecular biology are also introduced.
BIOL275L	Cell and Molecular Biology Lab	This course introduces students to laboratory techniques and procedures used in cellular and molecular biology, with an emphasis on their practical application and interpretation of experimental results. Students develop hands-on experience in cell fractionation, nucleic acid isolation, purification and quantification, protein extraction and quantification, agarose gel electrophoresis, and SDS-PAGE. The course emphasizes the safe use of laboratory equipment and materials, the analysis of experimental findings, and basic troubleshooting of laboratory procedures. Students also develop scientific reporting skills through the preparation of laboratory reports using standard scientific conventions. The course is designed for students majoring in the sciences who seek to develop practical laboratory skills in cellular and molecular biology.
BIOL425	Immunology	This course introduces the fundamental principles of immunology, including the cellular and molecular components of the immune system and the mechanisms of innate and adaptive immune responses. It examines lymphocyte activation, immune regulation, and antigen recognition and presentation. The course also addresses immune pathologies resulting from dysfunction of the immune system.

CHEM200	General Chemistry	This course is designed for students who wish to acquire the basic principles of chemistry. The emphasis of the course will be on the fundamental principles of general chemistry, which include terminology, qualitative concepts and quantitative skills. The general topics included in this course are: Quantum Theory of the Atom; Electrons and Periodicity; Bonding; Molecular Geometry; Hybridization; Acid-base Chemistry; equilibrium and Kinetics.
CHEM200L	General Chemistry Lab	This course lab covers the principles of general chemistry, emphasizes laboratory applications of these concepts, and prepares students for lab work. Moreover, in this course lab, you will be introduced to the world of chemistry through solution preparation, experimentation, and data analysis. You will also have the chance to become familiar with lab materials and equipment, and to learn about chemical substances, material storage and mixing, as well as their applications in the chemical and pharmaceutical fields.
CHEM250	Organic Chemistry I	This course will focus on laying the fundamental principles of Organic chemistry. We will cover the theory of chemical bonding, molecular structure and physicochemical properties in organic chemistry. We will analyze in depth the concepts of acidity and basicity, inductive effect and resonance theory. Stereochemistry and nucleophilic substitution and elimination (SN1,SN2, E1 and E2) concepts and applications will be covered in details. These principles will be applied to the chemistry of alkanes, alkyl halides, alcohols, and alkenes in the first semester of organic chemistry.
CHEM260	Analytical Chemistry	CHEM 260 Analytical Chemistry covers fundamental principles and quantitative methods of analytical chemistry, including solution stoeichiometry, statistical treatment of analytical data, chemical equilibria, acid–base systems and titrations, complexation and precipitation equilibria, and electrochemical systems. Emphasis is placed on quantitative problem-solving, interpretation of analytical data, and evaluation of chemical systems relevant to chemical, biological, and biochemical applications.
CHEM260L	Analytical Chemistry Lab	CHEM 260L is a laboratory course that complements CHEM 260 by applying its fundamental concepts through hands-on experimental work. Students learn common analytical techniques for the quantitative determination of analytes in samples relevant to everyday life, such as bleach, milk, and water, including acid–base and pH measurements, redox and EDTA complexometric titrations, spectrophotometry, and electrochemical methods. Working in line with good laboratory practice, including safe handling of chemicals and responsible waste management, students collect and analyze experimental data, evaluate its accuracy and reliability, and interpret their findings. They communicate their results in structured laboratory reports that use and cite reliable sources, developing the independent learning skills that support lifelong learning.
CHEM300	Organic Chemistry II	This course continues the study of the fundamental principles of Organic Chemistry introduced in CHEM 250. It provides an in-depth examination of the structure–reactivity relationships of conjugated systems and aromatic compounds, with emphasis on their chemical properties and reactions, including electrophilic and nucleophilic aromatic substitution. The course also covers the chemistry and properties of key functional groups, including aldehydes, ketones, carboxylic acids, amines, and their derivatives. Retrosynthetic analysis and detailed mechanistic aspects of organic reactions are also covered.
CHEM300L	Organic Chemistry Lab	CHEM300L is a laboratory course designed to develop students' mastery of essential organic chemistry techniques and their application in the synthesis, isolation, purification, and identification of organic compounds. The course emphasizes a thorough understanding of the underlying theory, the purpose of each experimental step, accurate and organized reporting of results, and critical analysis of data to draw logical conclusions, all while encouraging independent laboratory work and strict adherence to professional safety standards.
BIOC350	Biochemistry II (Intermediary)	This course covers different topics of recent Biochemistry research with emphasizing on the protein synthesis mechanisms and machinery in both Eukaryotes and prokaryotes and protein sequencing. Moreover, in this course, you will be introduced to the world of enzymes, the biological catalysts with remarkable properties that sustain life, so as to develop an understanding of enzyme kinetics, mechanism of enzyme action and their regulation. In addition, you will get to know how cholesterol and porphyrin are synthesized, and how xenobiotics are metabolized in your body and the diseases related to them. You will also learn about the different types of the reactive species that have direct impact on human health, and the different types antioxidants fighting them. Also, you shall learn how signal transduction occurs through a highly regulated cascade of events in side cells.

BIOC350L	Biochemistry II Lab	This lab course provides experience with techniques of broad use in biochemistry including chromatography and enzyme kinetics. You will have the chance to become familiar with lab materials and apparatus, and it prepare you to perform experiments independently. In this lab, we emphasize on the precision and accuracy while experimenting. Moreover, you will be introduced to the world of biochemistry in terms of preparing solutions, experimenting and interpreting the collected data.
BIOC400	Biochemistry III (Protein Structure & Function)	This course examines the relationship between protein structure and function at an advanced level. Topics include how amino acid chemistry determines three-dimensional structure, the relationship between primary sequence and folded structure, and the theoretical basis of computational structure prediction. Students relate structural features to biochemical function, analyze the molecular mechanisms that regulate protein activity, and critique published research on protein structure and function.
BIOC405	Enzymology	This lab-based course provides students with hands-on laboratory training in the extraction, purification, characterization, and analysis of enzymes and proteins. The course introduces fundamental biochemical techniques including buffer preparation, protein extraction, salting-out, dialysis, gel filtration chromatography, ion-exchange chromatography, spectrophotometric enzyme assays, Bradford protein quantification, and SDS-PAGE analysis. Students gain practical experience in enzyme activity measurement, protein purification workflows, data analysis, and scientific report writing. Emphasis is placed on laboratory safety, experimental design, quantitative interpretation of results, and the application of biochemical methodologies used in modern research.
BIOC445	Biotechnology	This course introduces fundamental biotechnology techniques used in modern research, diagnostics, and pharmaceutical biotechnology. Topics include molecular cloning, PCR and quantitative PCR, DNA synthesis and assembly, DNA sequencing, recombinant protein production, molecular diagnostics, and recombinant protein therapeutics. Students will explore the principles, applications, and limitations of these technologies, including their use in molecular diagnostics, genomics, proteomics, and gene-based medicine.
BIOC450	Advanced Lab Techniques in Biochemistry	This lab course provides a working knowledge of biochemical techniques and the use of these techniques in different fields. The subjects cover a broad range of laboratory techniques used in biochemistry and molecular biology research laboratories through both lectures and laboratory experience. Lectures will cover the use of modern techniques used in biochemistry and molecular biology and experimental design.
BIOC485	Modern Topics in Biochemistry	BIOC485 examines contemporary topics in biochemistry through primary research articles. Students interpret experimental data and synthesize findings by relating experimental approaches and results to biochemical processes and mechanisms. They appraise experimental validity in novel biochemical scenarios using approaches encountered in primary research. Students also integrate hypotheses, experimental approaches, and findings into evidence-based visual frameworks, followed by a critical appraisal of the conclusions of primary biochemical research articles. The course promotes self-directed learning through independent inquiry using scientific literature, specialized databases, and other appropriate scientific resources.
BIOL360	Human Physiology & Anatomy	This course is designed to teach students human physiology and anatomy. Physiology is the study of the process or function of living things. The major goals of physiology are to understand the response of the body to stimuli and understand how the body maintains conditions within homeostasis in various environmental conditions. The study of physiology consists of many different levels including cell physiology, organ physiology and systemic physiology. Students will be exposed to all of these levels starting at the cellular level and eventually moving up to the system level. Physiology and anatomy are closely related subjects. Anatomy is the scientific discipline that investigates body structures. Often to fully appreciate the physiology of a given system it is necessary to first examine its anatomy. A true understanding and appreciation of physiology can only occur if structure and function are concurrently learned.
BIOL360L	Human Physiology & Anatomy Lab	This laboratory course introduces the structure and function of the human body, with emphasis on the tissue, skeletal, muscular, nervous, and cardiovascular systems. Students examine histological specimens using light microscopy, identify anatomical structures through models and diagrams, and perform dissections of the heart, brain, and spinal cord. Laboratory activities integrate theoretical concepts with hands-on investigation, enabling students to develop skills in anatomical identification, microscopic observation, and specimen handling. The course also emphasizes adherence to laboratory safety regulations and ethical specimen-handling practices.

BIOL365	Genetics	This course introduces students to fundamental and recent concepts in molecular genetics, including the molecular organization, transmission of genetic information and the regulation of gene expression in prokaryotic and eukaryotic organisms. The course examines the genetic consequences of DNA mutations and defects in DNA repair, with emphasis on their roles in genetic disorders and cancer development. It also covers genetic linkage, recombination, genetic mapping, and the analysis of genetic-cross data. In addition, the course explores genomic data and functional genomics approaches used to investigate genome organization, gene function, and global patterns of gene expression.
BIOL385	Microbiology	This course covers principles of microbiology with emphasizing on the diversity and structural characteristics of microorganisms, impact of microbes on everyday life and the role of microbes in the host-pathogen interactions. Moreover, in this course, you will be introduced to the world of microbiology in terms of isolation, identification and classification. Also, you will have the chance to discover examples of different groups and species of microorganisms that have direct impact on human health, mechanism of causing diseases and the beneficial effects on the biotechnology sector as applications in the food industry.
BIOL385L	Microbiology Lab	This laboratory course introduces students to the core practical skills of microbiology. Students learn to prepare and sterilize culture media, dispose of biological waste safely, and use aseptic techniques to inoculate bacterial cultures. They apply staining and microscopy techniques to classify bacteria by cellular morphology and staining characteristics, and use enumeration methods to calculate bacterial concentrations in samples. They also evaluate the effectiveness of antimicrobial agents in controlling bacterial growth and classify unknown bacteria using biochemical tests. The course also develops students’ skills to communicate their experimental findings by writing scientific laboratory reports that include data, analysis, interpretation, and evidence-based conclusions.
BIOL490	Seminar	This course develops undergraduate students' foundational skills in finding, evaluating, and communicating scientific research in the biological and biochemical sciences. Designed for advanced undergraduate students, the course guides learners through structured literature database searching, step-by-step critical analysis of primary research papers, and clear visual and oral communication. Through guided research-based activities, a formal oral presentation, structured peer discussions, and brief reflective exercises on their own research and presentation process, students build the self-directed literature-inquiry habits essential for post-graduation lifelong learning.
BMED450	Clinical Chemistry	This course examines the biochemistry, physiology, and pathophysiological correlation of the major analytes assessed in the clinical chemistry laboratory, including carbohydrate, protein, lipid, and nonprotein nitrogen metabolism; vitamins and trace elements; diagnostic enzymology; hepatic, renal, and endocrine organ function; and acid-base/electrolyte homeostasis. Through case-based analysis of laboratory data, students develop the interpretive judgment, quality-assurance practices, and professional communication skills that define competent clinical decision-making in laboratory diagnostic services, in line with the course's defined learning outcomes and assessment structure
BMED450L	Clinical Chemistry Lab	This lab course gives students practical experience in common clinical chemistry tests. Students learn how to handle samples, perform laboratory tests, use basic laboratory techniques, and understand the results, with a focus on accuracy, safety, and good laboratory practice
CHEM310	Physical Chemistry I	This course provides a quantitative treatment of classical thermodynamics and its applications to chemical and biological systems. It develops the use of thermodynamic laws and state functions to evaluate energy changes, phase stability, reaction spontaneity, and chemical equilibrium in pure substances, mixtures, and biological processes. The course also establishes the link between reactivity and thermodynamic quantities.
CHEM440	Advanced Physical Chemistry	This course introduces the fundamental principles of quantum chemistry and their application to understanding the electronic structure, energy, and behavior of atoms and molecules. Students develop the ability to apply selected quantum mechanical models, including the particle-in-a-box and free-electron models, to simple chemical systems. The course examines the interaction of electromagnetic radiation with matter and the physical and chemical processes that occur following photoexcitation. Key topics include molecular electronic states, light absorption, electronic transitions, excited-state processes, fluorescence and phosphorescence, photochemical reactions and mechanisms, as well as selected applications of photochemistry. By integrating principles of quantum chemistry and photochemistry, the course provides a theoretical foundation for understanding molecular electronic structure, energy transitions, excited-state behavior, and photochemical processes.

BIOC455	Bioinformatics and AI	This course introduces the principles and practical applications of bioinformatics, machine learning, and artificial intelligence in modern biological and biochemical research. Students learn how biological data are generated, stored, retrieved, processed, analyzed, and interpreted using computational approaches. Topics include biological databases and data preprocessing, DNA and protein sequence analysis, sequence alignment, genome and transcriptome analysis, next-generation sequencing, protein structure prediction and modeling, introductory and advanced machine learning approaches, multi-omics data integration, bioinformatics algorithms, computational workflows, and emerging applications of AI in biological and biomedical research. Students will work with real or representative biological datasets and commonly used bioinformatics resources and software. Practical activities will emphasize biological interpretation, reproducible analysis, critical evaluation of computational results, and appropriate use of artificial intelligence as an analytical and learning tool.
BIOC330	Signal Transduction	This course examines how extracellular and intracellular signals are detected, transmitted, integrated, and translated into cellular responses. Building on prior knowledge of biochemistry and cell and molecular biology, students study selected signaling mechanisms with emphasis on calcium signaling, signal-dependent regulation of gene expression, protein kinase C, receptor tyrosine kinases, RAS-MAPK, PI3K-AKT, WNT/β-catenin, TGF-β/SMAD. The course emphasizes mechanistic connections between signaling pathways and the regulation of proliferation, survival, metabolism, polarity, migration, differentiation, stem-cell behavior, development, and oncogenic transformation. It provides a foundation for advanced undergraduate and postgraduate study in molecular biochemistry, cancer biology, developmental biology, cell biology, and related biomedical sciences.
CHEM465	Environmental chemistry	This course aims to introduce the principles and chemical processes that control chemical reactions in natural systems. Students will be introduced to the source, fate, and reactivity of compounds in natural and polluted environments. Emphasis will be placed on the chemistry of air, water, and toxic organic compounds as well as how anthropogenic activities affect this chemistry on planet Earth. Specifically, we will examine the sources, reactions, transport, effects, and fates of chemical species found in air and water. Environmental issues that will be discussed include stratospheric ozone depletion, causes and effects of global warming, pollution and treatment of water sources.
BMED435	Carcinogenesis and Oncology	This course provides advance knowledge in tumor biology. The course will introduce students to the molecular and cellular events involved in tumor development, progression, and metastasis. Furthermore, this course provides the student with comprehensive information highlighting different mechanisms leading to cancer formation. It provides detailed information as an introduction to cancer biology through formal lectures and selected topics for research and presentation. Topics selected cover the role of viruses, cellular and tumor oncogenes, tumor suppressor genes and the role of P53 in cancer development and progression.
ARAB200	Arabic lamguage and Literature	This course develops critical knowledge and practical skills in Arabic language and literature for non-specialists through three interconnected areas: literature, rhetoric, and textual analysis; grammar, morphology, and spelling; and techniques of academic and professional expression and communication. Students read texts from different literary periods and schools, analyze their structure, ideas, and stylistic and rhetorical features, and apply rules of grammar, morphology, and correct writing in the production of coherent functional and academic texts. The course also develops the capacity for responsible linguistic and cultural judgment and for accurate, informed use of Arabic in university and professional contexts. Learning is assessed through attendance, participation, classroom activities, the midterm examination, and the final examination.
CULT200	Introduction to Arab-Islamic Civilization	This course develops a critical understanding of the concept, formation, and interaction of civilizations, with a focus on Arab-Islamic civilization in its historical, social, intellectual, scientific, and artistic contexts. Students study examples of ancient civilizations, the conditions of the Arabs before the prophetic mission, the foundations and values of Arab-Islamic civilization, the experience of al-Andalus, and the contributions of scholars and thinkers to history, geography, philosophy, medicine, science, art, and architecture. They also analyze channels of interaction between East and West and the effects of knowledge transfer, and develop the capacity for responsible, evidence-based cultural judgment with respect for diversity and openness. Learning is assessed through an analytical project, a comparative civilization task, the midterm and final examinations, participation, and classroom activities.

ENGL201	Composition and Research Skills	This course builds upon students' previous knowledge of language and writing skills to develop advanced academic composition, source-evaluation, and research-writing competencies. Students engage with a variety of texts from different disciplines, applying critical reading and research strategies to evaluate, integrate, and synthesize information in their writing. The course emphasizes the composition of clear, coherent, and well-supported academic essays through the effective use of rhetorical strategies, academic language, and evidence from multiple sources. Students also develop proficiency in summarizing, paraphrasing, synthesizing, and citing source material accurately and ethically. Through guided practice, revision, and editing, students strengthen their ability to communicate ideas effectively and independently in research-based academic writing. Learning is assessed through written assessments, midterm examination and final examination.
ENGL251	Communication Skills	Communication Skills prepares students to communicate clearly, ethically, and professionally in contemporary academic and workplace contexts shaped by artificial intelligence, digital platforms, hybrid work, and multicultural collaboration. In the course, students study audience, purpose, tone, context, culture, and channel while applying a three-phase writing process of planning, drafting, and revising. They practice essential forms of workplace communication, including emails, memos, short digital messages, positive and neutral messages, bad-news messages, persuasive and sales messages, presentation materials, teamwork and meeting communication, résumés/CVs, cover messages, interview responses, and follow-up messages. The course also teaches students to evaluate and use AI tools responsibly as support for brainstorming, revision, preparation, design awareness, rehearsal, and reflection without replacing human judgment, accuracy, empathy, or academic integrity. Through lectures, discussion, message analysis, writing workshops, peer review, presentations, and practical assignments, students develop the communication competence needed for professional credibility, career readiness, and ethical participation in AI-supported workplaces.