School	Arts and Sciences		
Major	Bachelor of Physics		
Physics Major Courses			
Code	**Title**	**Credits**	**Description**
PHYS210	Mechanics	**3**	Develops a foundation in classical mechanics for science students through conceptual lectures and collaborative problem solving. Topics include motion in one and two dimensions, Newton's laws of motion, work and energy, linear momentum and collisions, uniform and nonuniform circular motion, and the rotation of rigid bodies. Students have the opportunity to build the mathematical and conceptual understanding needed to analyze multi-body systems using the conservation of energy and of linear and angular momentum.
PHYS250	Thermodynamics and Waves	**3**	Develops a foundational understanding of oscillations, waves, sound, and thermodynamics. Topics include simple harmonic motion, the propagation and interference of mechanical waves, standing waves, the speed, frequency, and pressure variations of sound, sound intensity and the decibel scale, the Doppler effect, temperature, heat transfer, phase transitions, and the laws of thermodynamics. Students have the opportunity to develop the analytical skills needed to solve physical problems and to connect theoretical concepts with real-world applications.
PHYS280	Electricity & Magnetism	**3**	Introduces calculus-based electromagnetism. Topics include electric forces and fields of point charges and continuous charge distributions, Gauss's law, electric potential, capacitance, direct-current circuits and Kirchhoff's rules, magnetic forces and fields, the Biot–Savart and Ampère laws, Faraday's and Lenz's laws, and an introduction to Maxwell's equations. Students have the opportunity to connect these topics to real-life applications and to develop strategies for solving standard problems in electromagnetism.
PHYS300	Mathematical Physics	**3**	Introduces the mathematical techniques used across physics. Topics include vector calculus in Cartesian and curvilinear coordinates with the divergence and Stokes theorems, matrix methods and eigenvalue problems, functions of a complex variable and analytic functions, the Dirac delta function, and Fourier series and transforms. Students have the opportunity to apply these methods to problems from different branches of physics.
PHYS330	Electromagnetic Fields and Waves I	**3**	Develops electrostatics at the intermediate level. Topics include the electric field and potential of charge distributions using Coulomb's and Gauss's laws, the work and energy of discrete and continuous charge distributions, conductors and capacitors, the solution of Laplace's equation by separation of variables and by the method of images, multipole expansion, and the field of an electric dipole. Students have the opportunity to apply these tools to describe the polarization, the displacement vector, and the dielectric constant of linear dielectric materials.
PHYS340	Modern Physics	**3**	Introduces special relativity and the foundations of quantum physics. Topics include the special theory of relativity, relativistic momentum and energy, the quantum theory of light, the particle nature of matter, matter waves, quantum mechanics in one dimension, and tunneling phenomena. Students apply these concepts to solve problems in relativistic and quantum physics.
PHYS350	Physical Optics	**3**	Introduces the fundamental principles of optics through ray and wave descriptions of light. Topics include reflection and refraction, image formation with lenses and mirrors, the wave and electromagnetic nature of light, light propagation in dielectric media, interference and coherence, and Fraunhofer diffraction. Students have the opportunity to apply these principles to analyze optical phenomena and to solve problems on the propagation and behavior of light.
PHYS360	Analytical Mechanics	**3**	Provides an intermediate study of classical mechanics. After a review of vectors, coordinate systems, and Newtonian mechanics, topics include position- and velocity-dependent forces, projectile motion, free, damped, and forced oscillations, noninertial reference frames, and the Lagrangian and Hamiltonian formalisms, including Hamilton's principle, generalized coordinates, and canonical equations. Students have the opportunity to apply Newtonian and analytical methods to model and analyze constrained mechanical systems.
PHYS380	Electromagnetic Fields and Waves II	**3**	Develops magnetostatics and electrodynamics at the intermediate level, culminating in Maxwell's equations. Topics include the Lorentz force law, the Biot–Savart law, the divergence and curl of the magnetic field, Ampère's law, the magnetic vector potential, magnetization and bound currents, the auxiliary field H and magnetic susceptibility, electromotive force, Faraday's and Lenz's laws, inductance and magnetic energy, and the displacement current. Students apply vector-calculus methods to solve standard problems in magnetism and electromagnetic induction.

PHYS420	Quantum Mechanics	**3**	Introduces the basic principles of quantum mechanics. Topics include the wave function and its statistical interpretation, normalization, momentum, the uncertainty principle, and the time-independent Schrödinger equation for the stationary states of the infinite square well, the harmonic oscillator, the free particle, the delta-function potential, and the finite square well. Students also have the opportunity to learn the mathematical formalism of quantum mechanics, using Dirac notation for observables and Hermitian operators in Hilbert space, and the generalized statistical interpretation.
PHYS430	Thermal Physics I	**3**	Develops classical thermodynamics from the macroscopic point of view. Topics include temperature and the zeroth law, equations of state of ideal and real gases, work and heat, the first and second laws of thermodynamics, the Carnot cycle and heat engines, entropy and the principle of increase of entropy, pure substances and phase diagrams, and the characteristic functions and Maxwell's relations. The course prepares students for statistical physics.
PHYS450	Solid State Physics	**3**	Introduces the physics of crystalline solids. Topics include crystal structures in two and three dimensions, Bravais lattices, Miller indices, the reciprocal lattice, and the determination of crystal structure by X-ray diffraction using Bragg's law and the Laue formulation. Lattice vibrations are treated as elastic waves in monatomic and diatomic crystals, and the Einstein and Debye models are used to explain heat capacity, thermal expansion, and thermal conductivity. Students also have the opportunity to study the free-electron Fermi gas model and its application to the electronic heat capacity and the electrical and thermal conductivity of metals.
PHYS470	Advanced Quantum Mechanics	**3**	Continues the introduction to quantum mechanics. Topics include the mathematical structure of quantum mechanics, the time-independent Schrödinger equation in three dimensions and the hydrogen atom, orbital and spin angular momentum, the addition of angular momenta, and systems of identical particles. Students have the opportunity to apply advanced mathematical techniques to three-dimensional and multi-particle quantum systems.
PHYS480	Thermal Physics II	**3**	Complements Thermal Physics I with statistical mechanics. Topics include distribution functions, Maxwell–Boltzmann, Fermi–Dirac, and Bose–Einstein statistics, black-body radiation, the partition function, the heat capacity of solids, and Bose–Einstein and Fermi–Dirac gases, with applications to monatomic and diatomic ideal gases. Students have the opportunity to relate the microscopic and macroscopic properties of physical systems.
PHYS490	Physics Seminar	**1**	Offers students the opportunity to explore independently a selected physics topic beyond the scope of the core curriculum. Students prepare a research-based report and presentation, and have the opportunity to develop skills in literature review, critical analysis, scientific writing, and oral communication, to discuss and defend scientific ideas, and to evaluate the work of their peers.
Physics Labs			
Code	**Title**	**Credits**	**Description**
PHYS250L	Thermodynamics and Waves Lab	**1**	Introduces the experimental techniques used to study oscillations, wave motion, and thermodynamics. Experiments cover Hooke's law, the simple pendulum and simple harmonic motion, Archimedes' principle, standing waves and the speed of sound, the mechanical equivalent of heat, the specific heat and heat capacity of metals, and thermal conductivity. Students have the opportunity to apply error analysis, to compare experimental results with theoretical predictions, and to write clear laboratory reports.
PHYS280L	Electricity and Magnetism Lab	**1**	Reinforces the concepts of electricity and magnetism through hands-on experiments. Students verify Ohm's law for a resistor, a capacitor, and a coil; study the grouping of resistors, RL circuits, and the charging and discharging of a capacitor; investigate the variation of resistance with temperature and the resistivity of a metal by the four-terminal method; and study resonance in a series RLC circuit, the magnetic field inside a solenoid, and the transformer. Students have the opportunity to build and diagram circuits, to read analogue and digital instruments and the oscilloscope, to estimate and propagate measurement uncertainties, to fit straight-line graphs by least squares, and to relate their results to Kirchhoff's, Ampère's, and Faraday's laws.
PHYS340L	Atomic Physics Lab	**1**	Provides hands-on experience of the experimental foundations of modern physics, primarily atomic physics, and of the relationship between experiment and theory. Experiments include the specific charge of the electron, the Millikan oil-drop experiment, electron absorption, the photoelectric effect, atomic emission spectra and the Rydberg constant, the Franck–Hertz experiment, and electron diffraction. Students have the opportunity to examine the dual nature of light and particles and the quantization of atomic energy levels, and to report their results with a proper treatment of uncertainties.

PHYS350L	Physical Optics Lab	**1**	Familiarizes students with historically important optical experiments and with modern optical instruments and methods. Students apply the laws of geometrical optics, including refraction, total internal reflection, lenses, and prisms, and investigate physical optics, including interference, diffraction, and interferometry, using a He-Ne laser and other optical equipment. Students have the opportunity to develop an understanding of the nature of light and of the concepts behind modern optical technology, and to report their measurements with a proper treatment of uncertainties.
Supporting Courses			
Code	**Title**	**Credits**	**Description**
CHEM200	General Chemistry	**3**	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.
CSCI250	Introduction to Programming	**3**	This course introduces the basic concepts and principles of structured programming in Java. It starts with an introduction to Java, its syntax and the structure of a Java program, and then covers simple data types, control structures, methods, arrays, and strings.
CSCI250L	Introduction to Programming Lab	**1**	This laboratory course is a corequisite of Introduction to Programming (CSCI250). Students apply the programming fundamentals explained in CSCI250 by solving lab exercises that use primitive data types, selection and repetition structures, methods, and arrays. The lab gives students direct help from the instructor when needed; it is not sufficient practice on its own, and students are expected to solve further exercises independently.
MATH210	Calculus II	**3**	This is the second course in the Calculus sequence. The course material includes logarithmic, exponential, and trigonometric functions, their inverses and their derivatives, integration techniques, improper integrals, sequences, infinite series, tests of convergence, alternating series, power series, polar coordinates and its application.
MATH220	Calculus III	**3**	The course extends the concepts of single-variable calculus to functions of several variables and introduces vector calculus. Topics include vectors and geometry in space, quadric surfaces, partial derivatives, multiple integrals, vector fields, line and surface integrals, and the fundamental theorems of vector calculus, including Green's and Stokes' Theorems.
MATH225	Linear Algebra with Applications	**3**	Linear algebra provides a fundamental framework for representing and analyzing mathematical problems that arise in many areas of science, engineering, economics, and other disciplines. Many such problems can be expressed in terms of vectors, matrices, and systems of linear equations, providing essential tools for their analysis and solution. This course introduces the fundamental concepts of linear algebra and their applications. The contents of this course include systems of linear equations, matrices and determinants, vectors and vector spaces, linear transformations, linear independence and bases, eigenvalues and eigenvectors, and applications of linear algebra.
MATH270	Ordinary Differential Equations	**3**	Mathematical models for many of the basic laws of the physical sciences and, more recently, of the biological and social sciences are formulated in terms of mathematical equations involving certain known and unknown quantities and their derivatives. Such equations are called differential equations. The study of differential equations is a vast subject. This course introduces to ordinary differential equations and their applications. The contents of this course include first order equations, separable, exact, and linear equations, second and higher order differential equations, systems of differential equations, series solutions, and Laplace transformation.
MATH305	Programming Languages for Scientists	**3**	This course provides a comprehensive introduction to scientific programming using MATLAB, equipping students with the computational skills needed to solve mathematical and physical problems. It covers fundamental programming concepts, including variables, arrays, control flow, function creation, and data visualization. Emphasis is placed on implementing numerical algorithms, developing efficient and well-structured code, and using MATLAB's built-in tools for linear algebra, polynomial manipulation, and numerical computation. Through hands-on laboratory sessions, students learn to translate mathematical formulations into executable programs and interpret computational results. .

MATH375	Numerical Methods for Scientists and Engineers	**3**	Numerical analysis provides approximate solutions to mathematical problems for which exact analytical solutions are unavailable or impractical. Students study the mathematical concepts, computational techniques and algorithms behind numerical methods, including root-finding, interpolation and polynomial approximation, numerical differentiation and integration, extrapolation, and initial-value problems for first- and higher-order ordinary differential equations. Emphasis is placed on the accuracy, stability and efficiency of each method. Computer-based laboratory sessions in MATLAB give students hands-on experience in turning mathematical algorithms into computational procedures and applying them to mathematical and scientific problems.
Major Electives			
Code	**Title**	**Credits**	**Description**
EDUC253	Technology Integration in Education	**3**	How can educators thoughtfully incorporate technology to boost student achievement and engagement? This course examines the evolving role of technology in the classroom, focusing on technology-enhanced instruction, digital tools for differentiated learning, and recent innovations in educational technology. Through experiential learning, collaborative projects, and case-based analysis, students connect theory to practice by integrating digital tools into authentic educational contexts. By the end of the course, learners will be equipped to choose and implement appropriate technologies across diverse educational settings and to design learner-centered, technology-supported lessons that foster engagement and academic success.
PHYS370	Nuclear Physics	**3**	Introduces the physics of the atomic nucleus and of elementary particles. Topics include the basic properties of nuclei, the liquid drop and nuclear shell models, radioactive decay and its applications, nuclear reactions, fission and fusion, and the fundamental forces, quarks, and the Standard Model. Students have the opportunity to apply conservation laws and nuclear models to quantitative problems.
PHYS495	Physics Senior Project	**3**	Gives senior physics students the opportunity to plan, carry out, and report an independent project under faculty supervision. Students select an experimental, computational, or theoretical topic, review the scientific literature critically, and formulate a well-defined research question with a realistic work plan. They carry out the project, keep accurate records, analyze data with an appropriate treatment of uncertainties, and compare their results with theoretical predictions. Through seminars, workshops, and regular supervisor meetings, students have the opportunity to develop skills in scientific writing, oral presentation, project management, and research ethics. The course culminates in a written report and an oral defense that integrate the knowledge and skills acquired throughout the physics program.
General Education			
Code	**Title**	**Credits**	**Description**
ARAB200	Arabic Language and Literature	**3**	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	**3**	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	**3**	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	**3**	ENGL251 – 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.