School	Arts and Sciences		
Major	Bachelor of Mathematics		
Core Requirements			
Code	**Title**	**Credits**	**Description**
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.
MATH260	Discrete Mathematics	**3**	This course introduces discrete mathematical structures. Students will learn how to use logical and mathematical formalisms to formulate and solve problems in computer engineering. Topics include formal logic, proof techniques, recurrence relations, sets, relations, functions, and algebraic structures.
MATH260L	Discrete Mathematics Lab	**1**	This laboratory course provides guided practice in the fundamental concepts and methods of discrete mathematics. Topics include logical statements and equivalences, mathematical proofs using standard techniques and mathematical induction, set operations, functions and countability through one-to-one correspondences, and mathematical relations and ordered structures, including equivalence classes, partially ordered sets, and lattices. Structured problem-solving activities help students apply these concepts and methods to mathematical exercises.
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.
MATH310	Probability and Statistics	**3**	The scope of this course is to provide a basic understanding of probability and statistics for students. The topics include basic combinatorics, general probability rules, total and Bayes' probability theorems, probability distribution/density functions for discrete/continuous random variables, expectation and variance of random variables, covariance of two random variables, binomial and Poisson probability distributions, Normal distribution, sampling distributions and central limit theorem, basic concept of statistics, confidence intervals and hypothesis testing.
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.
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.
Major Requirements			
Code	**Title**	**Credits**	**Description**
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. .
MATH315	Advanced Linear Algebra	**3**	This course offers a rigorous study of linear algebra beyond the elementary level. Emphasis is placed on abstract vector spaces, dimension and basis, inner product spaces, orthogonality, eigenvalue theory, diagonalization, quadratic forms, and linear transformations. The course develops proof-based reasoning together with computational and numerical techniques, preparing students for advanced study and applications in mathematics, physics, and engineering.
MATH330	Partial Differential Equations	**3**	Partial differential equations are fundamental to mathematical modelling in science and engineering and form a central area of applied analysis. This course introduces analytical methods for standard first- and second-order partial differential equations. Topics include quasi-linear equations and characteristics; classification and canonical forms of second-order linear equations; Fourier series and separation of variables; boundary-value problems for the wave, heat and Laplace equations; nonhomogeneous problems; Fourier and Laplace transforms, including convolution and step and impulse functions.
MATH345	Introduction to Real Analysis	**3**	This course covers the fundamentals of mathematical analysis, including the algebraic, order, and completeness properties of the real number system; sequences of real numbers and their limits; limits of functions and their algebraic properties; and continuity and differentiability. The course emphasizes the importance of abstract concepts and develops students' ability to understand and construct mathematical proofs.
MATH365	Abstract Algebra	**3**	This course introduces the fundamental concepts and structures of group theory, including groups, subgroups, cyclic and Abelian groups, permutation groups, isomorphisms, cosets and Lagrange's Theorem, normal subgroups and quotient groups, group homomorphisms, direct products, and the Fundamental Theorem of Finite Abelian Groups. Emphasis is placed on mathematical reasoning, proof construction, problem solving, and the analysis of algebraic structures and relationships among groups.

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.
MATH380	Complex Variables	**3**	This course provides an introduction to the theory and applications of functions of a complex variable. Topics include complex numbers and their geometric representation, analytic functions, limits, continuity, differentiation, and mappings. The course also covers complex integration, Cauchy's integral theorem and formula, Taylor and Laurent series, zeros and singularities of complex functions, residues, the residue theorem, and applications of complex analysis to the evaluation of integrals and related problems.
MATH385	Introduction to Topology	**3**	This course introduces the fundamental concepts of topology, including topological spaces, metric spaces, connectedness, and compactness.
MATH405	Number Theory	**3**	This course covers topics related to the theory of numbers. It aims to provide students with a background in classical number theory and to introduce them to the divisibility of integers, congruences, arithmetic functions, Diophantine equations, primitive roots, second-order congruences, quadratic residues, the Legendre symbol, the Jacobi symbol, and higher-order polynomial congruences. The course also familiarizes students with the applications of number theory in computer science and cryptography.
MATH420	Differential Geometry	**3**	Differential Geometry is designed to introduce students to the geometric structure of space or the universe's geometry through the eyes of differential calculus. This course aims to build a solid mathematical understanding of the fundamentals of differential geometry with some intuition and visual appreciation of the given topics. It is essentially based on the calculus of several variables. This course considers curves and surfaces in Euclidean spaces, intrinsic properties, Frenet-Serret formulas, curvature, torsion, first and second forms, geodesics, and extrinsic invariants of surfaces, First and Second forms.
MATH455	Mathematical Analysis	**3**	Integration theory gives a rigorous framework for the area under a curve and its link to continuity and differentiation. Students study the definition and properties of the Riemann integral, criteria for Riemann integrability, classes of integrable functions, and the Fundamental Theorem of Calculus. The course then examines the limitations of the Riemann integral and motivates the transition to Lebesgue measure and integration. Students learn to construct rigorous arguments about integrability, explain the relationship between differentiation and integration, and describe the basic principles of Lebesgue integration.
MATH490	Modern Topics in Algebra	**3**	This course is an introduction to ring and field theory. It covers polynomial rings over a commutative ring, matrix rings, ideals and homomorphisms, quotient rings, Euclidean domains, principal ideal domains, unique factorization domains, and field extensions.
MATH492	Mathematical Seminar	**1**	MATH492 is a one-credit seminar that prepares mathematics students for the Senior Project by developing essential skills in scholarly communication and independent learning. The course covers academic citation and referencing, mathematical report writing, scientific typesetting with LaTeX or equivalent software, collaborative project work, and the preparation of slide, oral, and poster presentations. Emphasis is placed on clear mathematical exposition, appropriate notation, professional presentation design, and confident communication of mathematical ideas.
Major Electives			
Code	**Title**	**Credits**	**Description**
MATH400	Special Functions	**3**	This course provides an in-depth study of special functions, which are important mathematical tools in various areas of science and engineering. The course explores the properties, applications, and techniques of the principal special functions, with a focus on developing a solid understanding of their fundamental concepts and their use in solving differential equations.
MATH460	Introduction to Functional Analysis	**3**	Functional analysis is an abstract branch of mathematics that grew out of classical analysis. Students study metric, normed, Banach, inner product and Hilbert spaces and the fundamental theorems for normed and Banach spaces: the Hahn–Banach, uniform boundedness, open mapping and closed graph theorems. Applications include the Banach fixed point theorem, approximation theory, the spectral theory of linear operators, and unbounded linear operators in quantum mechanics. Emphasis is placed on applying these abstract concepts to concrete problems in mathematics and physics.

MATH465	Selected Topics In Undergraduate Mathematics	**3**	This course introduces elementary and advanced methods for solving Diophantine equations, including classical equations, Pell-type equations, and applications of number theory. It also covers recurrence relations, generating functions, characteristic roots, and Fibonacci identities, emphasizing mathematical reasoning, problem-solving, and rigorous proof techniques.
MATH495	Mathematics Senior Project	**3**	This capstone course provides senior mathematics students with a structured transition from theoretical study to independent mathematical research and professional practice. Students develop research methodology, scientific writing, technical typesetting using LaTeX or Scientific Word, literature review skills, ethical scholarship, and professional presentation techniques. Each student completes an individual supervised research project culminating in a formal written report and an oral defence using Beamer. Collaborative applied activities are included to strengthen teamwork and problem-solving skills.
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.