

MATHEMATICS COURSES (MATH)

2020-2021

MATH 102 PRECALCULUS (3) *Prerequisite: At least two years of high school algebra.* This course includes the study of a variety of functions and their graphs and transformations, including linear, quadratic, rational, polynomial, logarithmic, exponential and trigonometric functions. The study of trigonometry will include both the right triangle and the unit circle approach. The course is intended to strengthen the algebra and trigonometry skills required for the study of calculus.

MATH 103 CALCULUS I (3) *Prerequisite: MATH 102.* This course introduces the student to elementary differential calculus with applications. It includes the study of a variety of functions and their graphs, limits, rates of change, the derivative and its applications. Specific topics include but are not limited to: calculating limits graphically, numerically, and algebraically; calculating the derivative using the limit definition; calculating derivatives of elementary functions and their sums, difference, products and quotients; interpreting graphs of derivatives; solving application problems involving rates of change and optimization.

MATH 104 CALCULUS II (3) *Prerequisite: MATH 103.* Differential and integral calculus of single variable transcendental functions, methods of integration, and applications are studied.

MATH 105 PROBLEM SOLVING IN MATHEMATICS (3) This course introduces students to the true nature of mathematics, what mathematicians really do, how they think, and what they try to accomplish. The focus is on using quantitative reasoning and intuitive logical thought techniques to solve problems rather than formal rigid processes. Selected topics may include, but are not limited to, number estimation, number theory, probability, mathematical modeling, regression, infinity, strange geometries, chaos and fractals, and famous math problems. This course meets the general education mathematics requirement.

MATH 106 LIBERAL ARTS MATHEMATICS (3) This course introduces the student to the language and modeling capabilities of mathematics by providing a broad overview of several different fields of mathematics. Topics may include but are not limited to: logic, linear algebra, probability, statistics, the mathematics of finance, and special topics. The goal is the development of an appreciation of the relevance of elementary mathematics in our daily lives, as well as the acquisition of analytical, qualitative, and quantitative problem solving and reasoning skills.

MATH 117 INTRODUCTION TO SCHOOL MATHEMATICS I (3) *Prerequisite: General Education Math.* This course covers key topics in school mathematics including an introduction to the central concepts of pre-secondary mathematics and the National Council of Teachers of Mathematics (NCTM) recommended standards. Topics include problem-solving methodologies, sets, elementary number theory, arithmetic of the whole and rational number systems. This course may not be used to satisfy any of the requirements for the mathematics minor or major.

MATH 118 INTRODUCTION TO SCHOOL MATHEMATICS II (3) *Prerequisite: MATH 117.* This is a continuation of MATH 117 and covers the basic concepts and operations of real numbers as well as various selected topics in mathematics from the recommended Standards of the National Council of Teachers of Mathematics (NCTM) and the PRAXIS exam. Topics include number theory, geometry and measurement, probability, and statistics. This course may not be used to satisfy any of the requirements for the mathematics minor or major.

MATH 211 CALCULUS III (3) *Prerequisite: MATH 104.* Polar coordinates, infinite series and sequences, multivariable calculus, partial differentiation, multiple integration, three-dimensional analytic geometry and applications are studied.

MATH 231 THE MATHEMATICS OF COMPUTER SCIENCE (3) This course introduces the theoretical and mathematical foundations of computer science. Topics include sets, summations and limits, number systems, mathematical induction, logic and Boolean algebra, probability and statistics, automata and grammars, combinatorics, and graph theory.

MATH 260W MATHEMATICAL REASONING AND PROOF [Writing Enriched] (3) *Prerequisites: MATH 104 and grade of C- or higher in ENGL 123W, HONR 103W, or equivalent.* This course is an introduction to mathematical reasoning as exemplified in the proof methodology inherent to formal mathematics. This course will include a formal study of logic and the different methods of proof and then use examples from various branches of mathematics to illustrate these ideas. Fields from which the examples will be taken include, but are not limited to, set theory, cardinality, relations and order, functions, elementary group theory, and combinatorics.

MATH 301 DIFFERENTIAL EQUATIONS (3) *Strongly Recommended: MATH 211.* This course focuses on existence and uniqueness theorems; first order equations; linear, homogeneous, and non-linear equations; transform methods; numerical methods; and series solutions.

MATH 304 COLLEGE GEOMETRY (3) *Prerequisite: MATH 104.* This course covers the important aspects of Euclidean Geometry including topics involving angles, triangles, parallel and perpendicular lines, circles, polygons, similarity, areas, volumes, as well as various selected topics in mathematics from the recommended Standards of the National Council of Teachers of Mathematics (NCTM) and the PRAXIS II exam. It is also intended to give students further exposure to the art of formal proof writing in a setting where many steps of the proof can be displayed and explained visually.

MATH 307 LINEAR ALGEBRA (3) *Strongly recommended: MATH 260W.* This course provides a study of linear transformations over vector spaces covering vectors, vector spaces, matrices, determinants, systems of linear equations, and linear transformations.

MATH 310W HISTORY OF MATHEMATICS [Writing Enriched] (3) *Prerequisite: Grade of C- or higher in ENGL 123W, HONR 103W, or equivalent; corequisite: MATH 260W.* This course will introduce students to mathematics from a historical perspective. Course topics will include number theory, algebra, geometry and calculus.

MATH 311 PROBABILITY THEORY (3) *Prerequisite: MATH 104.* This course introduces mathematical probability theory using an axiomatic approach and considering numerous applications.

MATH 313 COMPLEX VARIABLES (3) *Prerequisite: MATH 211.* This course examines properties of complex numbers; elementary functions of a complex variable; complex derivatives and analytic functions; mappings; definite and indefinite integrals; Cauchy's theorem and integral formulas; Taylor and Laurent expansions; singular points and the residue theorem; conformal mapping with applications.

MATH 323 NUMBER THEORY (3) *Prerequisite: MATH 260.W* This course deals with the properties of the set of integers. Topics considered include divisibility and division algorithm, congruences, quadratic residues, recurrence functions, diophantine equations, and continued fractions.

MATH 328 VECTOR ANALYSIS (3) *Prerequisite: MATH 211.* This course includes vector algebra; vector geometry; vector functions; vector calculus: derivatives, gradient, curl, divergence, and Laplacian operators; line and surface integrals; Stokes' and Gauss' theorems; applications to physics; generalized coordinates; linear vector spaces.

MATH 330 DISCRETE MATHEMATICS (3) *Prerequisite: MATH 260.* This course studies discrete structures that arise in mathematics, computer science, business and other areas of application. Topics covered may include, but are not limited to, the theory of counting, graph theory, enumeration, finite-state automata and formal languages

MATH 350W EXPERIMENTAL MATHEMATICS [Writing Enriched] (3) *Prerequisites: CS 131 or programming ability, grade of C- or higher in ENGL 123W, HONR 103W, or equivalent, and consent of the instructor.* This course will introduce students to the fine art of problem solving. The focus is on using computers, models, and examples to investigate problems rather than formal rigid processes to uncover a solution. Selected topics will include, but are not limited to, number theory, probability, mathematical modeling, graph theory, fractals, real analysis, and open math problems. This course will fulfill a math elective requirement.

MATH 376 STOCHASTIC CALCULUS WITH APPLICATIONS (3) *Prerequisites: MATH 311, STAT 333.* Topics may include but are not limited to: probability, stochastic processes, martingales, stochastic integrals, and stochastic differential equations. The course will concentrate on how these fields of mathematics apply to topics in risk management and finance.

MATH 387 DOMESTIC STUDY AWAY (3) Domestic Study Away is a parallel experience to study abroad as an experiential learning opportunity that allows students to earn academic credits toward the completion of a degree in an off-campus location using domestic destinations around the United States. Study away programs expose students to diverse perspectives and multiple modes of inquiry in ways not ordinarily achieved in a classroom setting.

MATH 397 INDEPENDENT STUDY IN MATHEMATICS (1-3) *Prerequisites: Approval of faculty sponsor and school dean; junior or senior standing.* This course provides students the opportunity to pursue individual study of topics not covered in other available courses. The area for investigation is developed in consultation with a faculty sponsor and credit is dependent on the nature of the work. May be repeated for no more than six credits.

MATH 398 SPECIAL TOPICS IN MATHEMATICS (1-3) [credit depends on topic] *Prerequisite: A background of work in the discipline.* This course will focus on an aspect of the discipline not otherwise covered by the regularly offered courses. The topic will vary according to professor and term; consequently, more than one may be taken by a student during his/her matriculation.

MATH 399 INTERNSHIP IN MATHEMATICS (1-12) *Prerequisites: Juniors or seniors with a 2.25 minimum QPA; approval of written proposal by internship coordinator, and supervising faculty prior to registration.* Students may earn college credit for participation in an internship with a business firm or agency, jointly supervised by the program and the responsible organization administrator. The internship is expected to provide the student with an opportunity to apply, in a practical way, some of the mathematical skills acquired. (See "Internships.")

MATH 405-406 ABSTRACT ALGEBRA (3, 3) *Prerequisite: MATH 260W.* Three hours lecture each semester. This course sequence introduces students to algebraic concepts such as groups, rings, integral domains, and fields. The elementary number systems occupy a central place. Mappings, especially homomorphisms, are introduced fairly early and emphasized throughout.

MATH 407-408 ADVANCED CALCULUS (3, 3) *Prerequisite: MATH 260W.* Three hours lecture each semester. This sequence introduces students to the foundations of analysis including a study of limits and continuity, functions of several variables, and finite and infinite series.

MATH 409 NUMERICAL ANALYSIS (3) *Prerequisite: MATH 211.* This course examines some commonly used numerical methods for the solutions of linear and non-linear equations and systems; difference calculus and interpolation; numerical differentiation and integration.

MATH 420 TOPOLOGY (3) *Prerequisite: MATH 260W.* This course explores basic concepts of a topological space; continuous functions and mappings; separation axioms; metric spaces; deformations; and topology of plane sets.

MATH 451W SENIOR PROJECT [Writing Enriched] (3) *Prerequisites: Grade of C- or higher in ENGL 123W, HONR 103W, or equivalent, senior standing, and at least three mathematics courses numbered 300 or higher.* This course serves as a capstone for those students with a major in mathematics. The student does an intensive study of a mathematics topic of his/ her choice under a supervising professor. This study must involve a synthesis of available material on the topic including (but not limited to): traditional books, journal articles, and web-based materials. The student must write a research paper on the topic and present it to a faculty committee.