

## Mathematics Courses

### **MAT 060 Essential Mathematics** (3 credits)

Although this is a three-credit course, the credits do not count toward graduation. This course is a comprehensive study of mathematical skills. Its main objective is to provide a strong mathematical foundation for further study. Topics include: principles and applications of decimals, fractions, percents, ratios, and proportions, order of operations, geometry, graphs, measurement, and elements of statistics. Upon completion students should be able to perform basic computations and solve real-world, multi-step mathematical problems using technology where appropriate. Prerequisite: Completion of the Math Placement Test.

### **MAT 070 Basic Algebra** (3 credits)

Although this is a three-credit course, the credits do not count toward graduation. This course meets three times per week, and is offered through the Mathematics Reinforcement Lab. It is “self-paced,” peer-tutored, and designed to prepare the student for Math 115. The topics will be structured to meet the individual needs of each student. A maximum of 9 credits may be earned from Math 070. Prerequisite: Math placement exam.

### **MAT 075 Intermediate Algebra** (3 credits)

Although this is a three-credit course, the credits do not count toward graduation. This course meets three times per week, and is offered through the Mathematics Reinforcement Lab. It is “self-paced,” peer-tutored, and designed to prepare the student for Math 115. The topics covered will be structured to the individual needs of each student. A maximum of 9 credits may be earned from Math 075. Prerequisite: Math placement exam.

### **MAT 106 Mathematics: The Science of Patterns** (3 credits)

This course engages the student in various mathematical topics interweaving historical highlights and current developments. Its purpose is to extend the student’s ability to reason with quantitative information and to develop the critical thinking and quantitative reasoning skills needed to understand major life issues. Mathematical topics covered will vary. The student should achieve an appropriate score on Part A of the Mathematics Placement Exam before enrolling in this course. The student must complete the Mathematics Placement Test prior to enrolling in this course.

### **MAT 115 Precalculus** (4 credits)

This course consists of lectures and computer labs and meets five hours per week. The course stresses concepts necessary for calculus, with particular emphasis on functions and their graphs, problem-solving and mathematical modeling, and an introduction to data analysis. This course will incorporate the use of computers and graphic calculators. The student must complete the Mathematics Placement exam prior to enrolling in this course. This course does not count toward a major in Mathematics. Prerequisite: An appropriate score on part B of the Mathematics Placement Exam, or permission of the instructor.

### **MAT 205 Statistics I** (4 credits)

This course consists of lectures and computer labs and meets five hours per week. An introduction to elementary techniques of statistics reinforced and facilitated by the use of a statistical computer package. This course emphasizes exploratory data analysis and the use of statistical inference in the study of population parameters. It includes both estimation and confidence interval testing procedures. The student must complete the Mathematics Placement exam prior to enrolling in this course. Prerequisite: An appropriate score on part B of the Mathematics Placement Exam, or permission of the instructor.

### **MAT 216 Topics in Discrete Mathematics** (3 credits)

A study of discrete models. Topics include graphs theory—trees, Eulerian and Hamiltonian circuits, and networks; combinatorics—elementary counting principles with applications to coding and genetic codes, permutations and combinations, inclusion/exclusion principles, and recurrence relations; matrices; and Markov chains. The course emphasizes problem-solving and modeling as opposed to algorithmic techniques. It is recommended for students of the social and natural sciences, as well as for majors in Business, Education, or Mathematics. Prerequisite: MAT 115 or Math placement exam.

### **MAT 221 Calculus I** (4 credits)

This course consists of lectures and computer labs and meets five hours per week. The concept “function” is studied from graphical, numerical, and symbolic perspectives. Exponential, logarithmic, and trigonometric functions are reviewed and studied in detail. Derivatives are studied in detail, with emphasis on rates of change, tangent lines, and local

linearity. Differential equations and initial value problems are introduced, with emphasis on geometric and modeling perspectives. Computers and computer labs are used throughout. The student must complete the Mathematics Placement exam prior to enrolling in this course. Prerequisite: Either MAT 115, appropriate scores on parts B and C of the Mathematics Placement Exam, or permission of the instructor.

**MAT 222 Calculus II** (4 credits)

This course consists of lectures and computer labs and meets five hours per week. Differential equations and initial value problems are studied, with emphasis on geometric and modeling perspectives. Integration, symbolic and numerical, is studied in detail, with applications, including distance, area, volume, centers of mass, arc length, and probability. Sequences and series of numbers and functions are studied. Computers and computer labs are used throughout. Prerequisite: Either MAT 221 or permission of the instructor.

**MAT 310 Multivariable Calculus** (4 credits)

This course consists of lectures and computer labs and meets five hours per week. Vectors, analytic geometry of functions of two or three variables, partial derivatives, multiple and iterated integrals, extrema of functions of two variables, line integrals, and Green's Theorem in the plane are topics discussed in this course. Computer labs will be used to enhance these topics. Prerequisite: MAT 222.

**MAT 312 Linear Algebra & Applications** (4 credits)

This course consists of lectures and computer labs and meets five hours per week. It is a matrix-oriented course which proceeds from concrete, practical examples to the development of the general concepts and theory. Topics include matrix operations, systems of equations, determinants, properties of  $R_n$ , eigenvalues and eigenvectors, orthogonality, and partitioned matrices. Prerequisite: MAT 222.

**MAT 317 Operations Research** (4 credits)

This course consists of theory and application of representative methods in operations research, including topics from linear programming, network analysis, dynamic programming, game theory, and queuing theory. Prerequisites: MAT 216, MAT 312, and CIS 121 or permission of instructor.

**MAT 325 An Introduction to Axiomatic Systems & Abstract Algebra I**

(3 credits)

An introduction to predicate logic and methods of proof in the contextual setting of elementary group theory. Topics will include equivalence relations, semigroups, groups, subgroups, normal subgroups, and quotient groups. Prerequisite: MAT 222 or permission of the instructor.

**MAT 340 Ordinary Differential Equations: A Model Theoretic Approach**

(4 credits)

This course consists of lectures and computer labs and meets five hours per week. Throughout this course, mathematical models are used to introduce, illustrate, and motivate various concepts. Among the topics treated are first order equations, numerical methods, second order linear equations with applications to mechanical vibrations and harmonic motion, higher order linear equations, Laplace transform, series solutions, matrix methods for linear systems, and nonlinear systems. Computer experiments are designed to deepen understanding of concepts, and to carry the study of certain topics to further exploration. Prerequisite: MAT 312, or permission of instructor.

**MAT 343 Statistics II** (3 credits)

A brief review and continuation of MAT 205. Emphasis is on methods (both theory and implementation) for multiple regression and analysis of variance. A statistical software package is used as appropriate. Non-parametric methods are included. Prerequisite: MAT 205.

**MAT 350 Mathematical Modeling** (4 credits)

This course consists of lectures and computer labs and meets five hours per week. This course is designed for the students to analyze, interpret, and criticize a collection of mathematical models arising in ecology, economy, science, etc. The deterministic view is adopted throughout the course. Among other models, the course includes decay of pollution, radioactive decay, plant growth, simple ecosystems, economic growth, population dynamics, chemical dynamics, and traffic dynamics. Computer experiments form an integral part of this course. Prerequisite: MAT 340 or permission of instructor.

**MAT 401 Introduction to Numerical Analysis** (4 credits)

This course consists of lectures and computer labs and meets five hours per week. Polynomial approximation, numerical differentiation and integration, numerical solution of differential equations, and numerical linear algebra are some of the topics covered in this course. Emphasis is placed on error analysis. Computer programs are implemented to investigate these topics. Prerequisites: MAT 312 and MAT 340.

**MAT 422 Abstract Algebra II** (3 credits)

This is an extension of the theory of algebraic structures including rings, fields, associative fields, etc. Associated topics such as category, morphism, isomorphism, coset, ideal, etc., are discussed. Some applications in other branches of mathematics and physics, genetics, and information theory are also included. Prerequisites: MAT 312 and MAT 325.

**MAT 450 Real Analysis** (3 credits)

This course develops the theory of calculus. Topics include topology of the real line, properties of continuous maps, sequences of functions, uniform convergence, the Riemann integral, derivatives and differential forms. Prerequisites: MAT 310 and MAT 325.

**MAT 479 Senior Seminar** (2 credits)

This course is open only to, and required of all, senior Mathematics majors, as well as of all senior Mathematics with Concentration in Computer Science majors. The student will set up a portfolio of his or her mathematical and related work, investigate mathematical literature, and give oral and written presentations.