

# MA: Mathematics

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## Mathematics Proficiency

Mathematics Proficiency is a requirement for the AAS degree and is a prerequisite for all mathematics and science classes. Based on placement, a student who shows need for improvement in mathematics may be required to enroll in MA 080 or MA 081 before registering for classes that have Mathematics Proficiency as prerequisite. Mathematics Proficiency may be demonstrated by a qualifying score on the mathematics portion of the SAT or ACT or by placement exam for students that do not have SAT or ACT scores. The Mathematics Proficiency may also be satisfied by transfer of an appropriate credit-bearing mathematics course or by a passing grade in an equivalent developmental mathematics course offered at another accredited college or university.

### MA 041 — Geometry and Probability Skills

1 credit; 1 lecture hour

For Toy Design students. This course helps students develop the fundamental computational skills required for MA 241. Corequisite(s): MA 241.

### MA 080 — Fundamentals of Mathematics

4 credits; 4 lecture hours

This is a basic mathematics course with an emphasis on applications. This course reviews such topics as fractions, percents, decimals, ratios and proportions, rounding and estimating, measurement systems, linear equations and inequalities, and systems of linear equations. It is designed to provide the necessary skills for credit-bearing mathematics and sciences courses. Prerequisite(s): SAT scores of 530 or above will not require this course. ACT scores of 23 and above will not require this course.

### MA 081 — Mathematical Literacy

4 credits; 4 lecture hours

In this group-work based course, students integrate fluency with numbers, proportional reasoning, data interpretation, algebraic reasoning and communicating quantitative information through group problem solving and class discussions. Problems are drawn from the areas of citizenship, personal finance, and medical literacy. Students will use a scientific calculator. This course satisfies the Mathematics Proficiency requirement. It is an alternate to MA 080 Basic Mathematics. Prerequisite(s): SAT scores of 530 or above will not require this course. ACT scores of 23 and above will not require this course.

### MA 103 — Research Methods

3 credits; 3 lecture hours

Enhance your decision-making skills by using research methods in your life. Using guided, step-by-step instructional support, you will be able to design your own research, carry it out, and learn how to analyze the results. You will be able to apply the scientific research method in a practical, everyday context, and understand the value of research by gaining research skills through hands-on activities. Prerequisite(s): mathematics proficiency (see beginning of Mathematics section).

### MA 122 — Foundations of Data Science

3 credits; 3 lecture hours

This course introduces the foundation of data science. It provides students with an understanding of the role of data science in making meaningful, data-driven decisions and predictions. This course is intended for students with no programming experience. Prerequisite(s): Mathematics Proficiency.

### **MA 142 — Geometry and the Art of Design**

3 credits; 3 lecture hours

A contemporary primer of geometric topics that expand the concepts of shape and space, this course presents some of the established and emerging ways geometry can provide tools and insights for artists and designers. Included are a variety of visual phenomena such as fractals, knots, mazes, symmetry, and the golden ratio. Prerequisite(s): mathematic proficiency (see beginning of mathematics section).

### **MA 145 — Math, Paper, Scissors**

3 credits; 3 lecture hours

Using a variety of puzzles and problems, students will explore the mathematics that emerges from paper folding and cutting. Students will learn to build models, analyze algebraic and geometric relationships, make conjectures, and develop proofs with paper. Applications in fashion, product design and technology will be introduced. Prerequisite(s): Mathematics proficiency.

### **MA 153 — Programming and Mobile Apps**

3 credits; 3 lecture hours

This course is an introduction to programming for mobile apps. Through visual programming tools, students learn to build mobile apps and control all aspects of the application. Computer science concepts are introduced to provide a complete understanding of the programming process. No previous programming experience is required.

Prerequisite(s): mathematic proficiency (see beginning of Mathematics section).

### **MA 161 — Mathematical Ideas**

3 credits; 3 lecture hours

Provides an overview of the historic, heuristic, and visual dimensions of mathematics. Includes the golden ratio, fractal geometry, sets and groups, logic and circuits, Euler diagrams, number theory, and discrete math. (G2: Mathematics) Prerequisite(s): mathematics proficiency (see beginning of Mathematics section).

### **MA 200 — A Visual Approach to Numbers**

3 credits; 3 lecture hours

This course is a visual primer for elementary number theory. It explores patterns within the natural numbers, integers and rational numbers. Topics include divisibility, remainders, prime numbers, fractions, the greatest common factor, the Euclidean Algorithm, congruence, modular arithmetic, linear equations, Fermat's little theorem, and cryptography. Whenever possible, visualizations will be used to demonstrate these concepts. Real life examples will draw from the visual arts, music theory, and data communication. Prerequisite(s): mathematic proficiency (see beginning of Mathematics section).

### **MA 213 — Quantitative Methods**

3 credits; 3 lecture hours

Explores the mathematical model-building process in the settings provided by linear programming and probability. Includes simplex methods for solving linear programs; duality; matrix algebra; probability models based on equally likely outcomes, independent events, and conditional probability; applications, particularly to business and economics; and elementary math of finance. (G2: Mathematics)

Prerequisite(s): mathematics proficiency (see beginning of Mathematics section).

### **MA 222 — Statistical Analysis**

3 credits; 2 lecture and 2 lab hours

Studies the principles and methods of statistical analysis including probability distributions, sampling distributions, error of estimate, significance tests, correlation and regression, chi-square, and ANOVA. Introduces the use of the computer to store, manipulate, and analyze data.

Prerequisite(s): mathematic proficiency (see beginning of Mathematics section).

### **MA 231 — Precalculus**

3 credits; 3 lecture hours

This traditional precalculus course introduces students to math concepts for a wide variety of applications. Topics include polynomial, rational, exponential, and logarithmic functions; sequences and series; analytic geometry; and trigonometry.

Prerequisite(s): mathematic proficiency (see beginning of Mathematics section).

### **MA 241 — Topics in Probability and Geometry**

3 credits; 3 lecture hours

For Toy Design students. The understanding of geometry and probability in everyday natural and social environments and their use as tools for analysis and creativity in toy design. Shapes and figures are examined through geometrical study. Problems in probability are translated from mathematical concepts to real situations.

Co-requisite(s): MA 041.

### **MA 272 — Islamic Art and Mathematics (Interdisciplinary)**

3 credits; 3 lecture hours

This is an interdisciplinary course cross-listed with HA 272. Students are introduced to the art and architecture of the Islamic world from the 7th century CE to the present. They are given a glimpse into the intertwined nature of mathematical, structural and decorative languages used by artisans and designers in this period.

### **MA 299 — Independent Study in Mathematics**

1-3 credit

Prerequisite(s): a minimum 3.5 GPA and approval of instructor, chairperson, and dean for Liberal Arts.

### **MA 300 — The Mathematics of Financial Life Management**

3 credits; 2 lecture and 2 lab hours

Uses advanced mathematical and statistical techniques to analyze select topics in personal finance. Includes exploration into annuity analysis, regression methods, and time series analysis. Application areas involve managing credit cards, paying back student loans, and choosing a stock. Uses computers to analyze and interpret financially based data.

Prerequisite(s): mathematic proficiency (see beginning of Mathematics section).

### **MA 301 — Graph Theory (Honors)**

3 credits; 3 lecture hours

The objective of the course is to introduce students with fundamental concepts, theorems, and algorithms in graph theory, with its connections to everyday life. Topics covered in this course include: graphs, paths, graph isomorphism, Eulerian graphs, Hamiltonian graphs, cycles, directed graphs, trees, spanning trees, adjacency matrices, planarity, and graph coloring. Prerequisite(s): Any 100-299 MA course and Qualification for Presidential Scholars or a min 3.5 GPA with approval of Dean for Liberal Arts.

### **MA 311 — Mathematical Modeling for Business Applications**

3 credits; 2 lecture and 2 lab hours

To instill the value of mathematics as a tool for modeling real-life situations, this course focuses on an analytical approach to business decision-making. Topics covered include finance, cash flow, probability, linear programming, and the business applications of basic equations. Microsoft Excel is used.

Prerequisite(s): mathematic proficiency (see beginning of Mathematics section).

### **MA 321 — Data Analysis for Business Applications**

3 credits; 3 lecture hours

This course covers intermediate statistics topics with applications to business. Students graph, manipulate, and interpret data using statistical methods and Excel. Topics include data transformations, single and multiple regression, time series, analysis of variance, and chi-square tests. Applications are from the areas of retail, finance, management, and marketing. Prerequisite(s): MA 222.

### **MA 322 — Statistics, Machine Learning, and Data Mining**

3 credits; 3 lecture hours

This is an introduction to statistical techniques for machine learning and data mining. It emphasizes mathematical methods and computer applications related to automated learning for prediction, classification, knowledge discovery, and forecasting in modern data science. An appropriate programming language such as R or python will be used. Prerequisite(s): MA 222 and mathematic proficiency (see beginning of Mathematics section).

### **MA 324 — Data Analytics for Future Industries**

3 credits; 3 lecture hours

The course aims to introduce students to data analytics, which is crucial for gaining insights from data and making data-driven decisions. Throughout the course, students will develop a foundational understanding of key data analytics concepts, including data mining, data pre-processing, exploratory data analysis, visualization, and text mining. In addition, students will gain hands-on experience working with popular data analytics tools, such as Python libraries, through computer programming exercises. Prerequisite(s): MA 222.

### **MA 329 — Predictive Analytics for Planning and Forecasting (Interdisciplinary)**

3 credits; 2 lecture and 2 lab hours

This is an interdisciplinary course cross-listed with FM 329. This course provides students interested in predictive analytics with an understanding of statistical applications to retail merchandising with a focus on case studies from the company Planalytics. Students apply time series analysis to case studies to understand how analytics techniques lead to stronger sales, fewer markdowns and improved gross margins. Prerequisite(s): MA 222.

### **MA 331 — Calculus**

3 credits; 3 lecture hours

This course provides an introduction to basic differential Calculus. Students will study techniques of differentiation including the product rule, quotient rule, general power rule, chain rule. There is an emphasis on applications rather than rigorous mathematical proofs. The exponential and logarithmic functions, along with elementary differential equations will show a direct connection to the physical world. Prerequisite(s): MA 231.

### **MA 332 — Calculus II**

3 credits; 3 lecture hours

This course continues the development of the differential and integral calculus topics covered in Calculus I. Students interpret the integral both as an antiderivative and as a sum of products. Students employ the standard techniques of integration to solve problems involving business applications. Topics to be covered include L'Hopital's rule, integration by parts, power series, and the integration of standard mathematical functions. Prerequisite(s): MA 331.

### **MA 361 — Number Theory**

3 credits; 3 lecture hours

Students are introduced to modular arithmetic and basic cryptography algorithms through a systematic treatment of topics such as divisibility, remainders, fractions and functions, mod b, and Fermat's little theorem. The course culminates in applications of the RSA encryption algorithm.

Prerequisite(s): mathematic proficiency (see beginning of Mathematics section).

### **MA 391 — Mathematics of the Ancient World in Its Cultural and Historic Context (Honors)**

3 credits; 3 lecture hours

This interdisciplinary survey of mathematics from prehistory to Archimedes covers topics from the basic (different ways of conceiving numbers) to the complex (a proof of the Pythagorean theorem). The cultural and historical context of the mathematical achievements of ancient Egypt, Mesopotamia, and Greece are emphasized in a way that shows these achievements as a natural and integral part of the civilizations that created them. Comparisons to modern methods in mathematics are stressed.

Prerequisite(s): Qualification for Presidential Scholars or a min 3.5 GPA with approval of dean for Liberal Arts and mathematic proficiency.

### **MA 392 — The Mathematics of Personal Finance (Honors)**

3 credits; 2 lecture and 2 lab hours

Students interpret and draw inferences from mathematical models that underlie essential notions of financial planning. Students represent mathematical information symbolically, verbally, and in writing within a financial context, exploring interest types, retirement, taxation, credit cards, mortgages, and investing.

Prerequisite(s): mathematic proficiency (see beginning of Mathematics section) and qualification for Presidential Scholars Program, or 3.5 GPA with approval of dean for Liberal Arts.

### **MA 499 — Independent Study in Mathematics**

3 credits; 3 lecture hours

Students work individually with math instructor to explore salient area of research within the mathematics discipline (computer programming, personal finance, statistics, geometry, etc.). Must have a minimum of 3.5 GPA and approval of instructor, chairperson, or dean for Liberal Arts.