

*Dr. Joseph W. Francis, Chairperson*

Due to the ever-increasing influence of technology, the study of mathematics is crucial not only for logical thinking, but also for the preparation for any technical vocation. In addition, mathematics is a vital part of any well-rounded liberal arts education.

The mathematics curriculum is designed to provide a strong foundational core for the student interested in pursuing graduate study and to offer students the opportunity for preparation in fields relating to applied mathematics, such as statistics and teaching. The Department of Mathematics provides a strong and thorough offering in mathematics as a part of God's creation in a concentrated effort to integrate faith and learning. A minor in mathematics is available to students from all other departments and can be pursued in conjunction with every other major on campus.

### Career Opportunities

The education students receive in Mathematics at The Master's College will provide the first step toward careers in:

- Actuarial Science
- Applied Mathematics
- Business
- Economics
- Education
- Engineering
- Financial Analysis
- Information Systems
- Market Analysis
- Numerical Analysis
- Operations Research Analysis
- Statistics

### Credit by Examination

The Department of Mathematics will grant course credit for MA121 Calculus I for the AP Calculus AB examination, MA 121 Calculus I and MA 122 Calculus II for the AP Calculus BC examination, or the AP Statistics examination for MA 262 Elementary Statistics. The student must submit proof of an earned test score of 3 or better on the appropriate Advanced Placement Examination of the College Board or a score of 55 or above on the College Level Examination Program test.

### California Single Subject Teaching Credential in Mathematics

Students interested in obtaining a California Single Subject Teaching Credential in Mathematics should contact both the Mathematics and Teacher Education Departments' advisors about specific requirements for this credential.

### Comprehensive Examination

Students graduating with a degree in Mathematics will be required to take the Senior Subject Examination in Mathematics in their senior year prior to graduation.

### MATHEMATICS CORE COURSES

The following courses are required of every student who wishes to pursue a degree in mathematics from The Master's College:

CS111	Intro. to Computer Programming.....	3
CS111L	Intro. to Computer Programming Lab .....	1
MA121	Calculus I.....	4
MA122	Calculus II .....	4
MA221	Calculus III.....	4
MA231	Linear Algebra .....	3
MA282	Ordinary Differential Equations.....	3
MA302	Introduction to Mathematical Proof.....	3
MA400	Mathematics Seminar.....	2
MA412	Integrated Review .....	1
<i>Total core courses .....</i>		<i>28</i>

In addition to the Mathematics Major Core Courses, each student must choose an emphasis that they would like to pursue from Pure Mathematics, Applied Mathematics or Mathematics Education. The requirements for each of these emphases are as follows:

### Pure Mathematics Emphasis Courses

Mathematics Major Core Courses .....	28	
MA222	Calculus IV .....	1
MA343	Modern Geometry.....	3
MA355	Number Theory/History of Mathematics.....	3
MA383	Complex Analysis .....	3
MA445	Real Analysis I .....	3
MA453	Abstract Algebra I .....	3
MA482	Topics in Mathematics .....	3
Additional Upper Division Mathematics Courses .....	6	
<i>Total units required for emphasis .....</i>	<i>53</i>	

### Applied Mathematics Emphasis Courses

Mathematics Major Core Courses .....	28	
MA222	Calculus IV .....	1
MA253	Discrete Mathematics .....	3

MA326	Numerical Analysis.....	3
MA366	Probability.....	3
MA425	Mathematical Modeling.....	3
MA433	Partial Differential Equations.....	3
MA445	Real Analysis I.....	3
MA482	Topics in Mathematics.....	3
	Additional Upper Division Mathematics Course.....	3
	<i>Total units required for emphasis</i> .....	53

### Mathematics Education Emphasis Courses

	Mathematics Major Core Courses.....	28
MA253	Discrete Mathematics.....	3
MA262	Elementary Statistics.....	3
MA344	Modern Geometry.....	3
MA355	Number Theory/History of Mathematics.....	3
MA425	Mathematical Modeling.....	3
MA453	Abstract Algebra I.....	3
	Additional Upper Division Mathematics Courses.....	6
	<i>Total units required for emphasis</i> .....	52

### Minor in Mathematics

For those students interested in pursuing a Mathematics minor, the following courses are required:

MA121	Calculus I.....	4
MA122	Calculus II.....	4
MA221	Calculus III.....	4
MA231	Linear Algebra.....	3
MA282	Ordinary Differential Equations.....	3
MA400	Mathematics Seminar.....	1
	Additional Upper Division Mathematics Courses.....	6
	<i>Total units required for minor</i> .....	25

### Notes

1. All students who are interested in going to IBEX should consult their respective advisors as early as possible.
2. All students in the Mathematics Education Emphasis are strongly urged to take ED400 and ED410 during their last two years *in addition to* the courses required for the Bachelor's degree as a preparation for the Fifth Year Program. Contact the Teacher Education Department for more information.
3. A maximum of two (non-general education) upper division courses from another department may be used to satisfy the "Additional Upper Division Mathematics Courses" requirement subject to the *prior* approval of the student's major advisor.

## Course Offerings in Mathematics

### MATHEMATICS

#### MA078 Basic Mathematics (1)

This course covers the nature of numbers and fundamentals of operations, an introduction to geometry, solving consumer applications and algebra. This course does not count toward a degree and is graded on a Pass/Fail basis.

#### MA090 Intermediate Algebra (1)

This course covers further studies in linear equations and inequalities, rational expressions, roots and radicals, systems of equations and functions and their graphs: polynomial, rational, exponential and logarithmic. This course is intended for those who need a refresher course before enrolling in ACC210, BUS310 and MA101. This course does not count toward a degree and is graded on a Pass/Fail basis.

#### MA101 College Algebra & Trigonometry (3)

A standard course combining algebra and trigonometry intended as a preparation for MA121 Calculus I. *Prerequisite:* Two years of high school algebra, successful completion of MA090 or instructor approval.

#### MA121 Calculus I (4)

The first semester of a unified course, this class covers basic analytic geometry, limits, continuity, differentiation, applications of the derivative, antiderivatives and the definite integral and its applications. *Prerequisite:* MA101 or equivalent. (Lab fee \$20.)

#### MA122 Calculus II (4)

The second semester of a unified course, this class covers differentiation and integration of exponential, logarithmic, and trigonometric functions, additional integration techniques, numerical methods, indeterminate forms, improper integrals, infinite sequences and series. *Prerequisite:* MA121. (Lab fee \$20.)

#### MA201 Mathematics for Elementary School Teachers I (3)

The first semester of a unified course that provides basic mathematical competency for teachers at the elementary school level. Emphasis is placed upon problem solving and understanding the principles underlying mathematical concepts. This course is strictly intended for liberal studies majors seeking to meet breadth requirements in mathematics. Topics to be covered include sets, whole numbers, functions, whole-number computation, integers, basic number theory, rational numbers, decimals, percents and real numbers. *Prerequisite:* Permission of the Teacher Education Department.

**MA202 Mathematics for Elementary School Teachers II (3)**

The second semester of a unified course that provides basic mathematical competency for teachers at the elementary school level. Topics to be covered include probability, statistics, introductory geometry, constructions, congruence, similarity, measurement, motion geometry and tessellations. *Prerequisite: Permission of the Teacher Education Department.*

**MA221 Calculus III (4)**

The third semester of a unified course, this class covers such topics as vectors, calculus on vector-valued functions, functions of several variables, partial differentiation and multiple integration. *Prerequisite: MA122.* (Lab fee \$20.)

**MA222 Calculus IV (1)**

The fourth semester of a unified course, this class covers topics in advanced vector analysis including vector fields, line integrals, Green's Theorem, surface integrals, the Divergence Theorem, and Stokes' Theorem. *Prerequisite: MA221.* (Lab fee \$20.)

**MA231 Linear Algebra (3)**

A course on the theory of linear equations and vector spaces, topics to be covered include linear equations, matrices, determinants, vectors, real vector spaces, eigenvalues, eigenvectors and linear transformations. *Prerequisite: MA122.*

**MA240 Critical Thinking & Problem Solving (3)**

An interdisciplinary course designed to provide the student with the analytical tools and concepts for dealing with practical "everyday" problems. Emphasis is placed on developing critical, analytical thinking and reasoning skills in the context of quantitative and logical applications. Topics covered may include logic, fallacies, abuse of numbers and percentages, problem-solving techniques, financial calculations, statistics, correlation, the normal distribution, probability and mathematics in the arts and politics.

**MA253 Discrete Mathematics (3)**

This course is a study of discrete structures commonly used in computer science and mathematics, including topics from sets and relations, permutations and combinations, graphs and trees, induction, recursion and Boolean Algebras. *Prerequisite: MA121.*

**MA262 Elementary Statistics (3)**

This is a general course in elementary statistics dealing with the collection, organization, display and inferential techniques of modern data analysis. Topics covered may include descriptive statistics, bivariate data, probability, probability distributions, sampling distributions and

common hypothesis tests. *Prerequisite: MA101 or equivalent.*

**MA282 Ordinary Differential Equations (3)**

This course covers the forms and solutions of many different types of ordinary differential equations and their applications in the sciences. *Prerequisites: MA221 and MA231.*

**MA302 Introduction to Mathematical Proof (3)**

A practical introduction to formal mathematical proof emphasizing preparation for advanced study in mathematics. Special attention is paid to reading and building proofs using standard forms and models within the context of specific examples. *Prerequisite: MA221.*

**MA324 Numerical Analysis (3)**

This course covers some of the main techniques of applied mathematics and includes such topics as the solution of equations, interpolation, numerical integration, and the numerical solution of differential equations. *Prerequisites: CS111 and MA282.*

**MA344 Modern Geometry (3)**

This course covers finite geometries, modern Euclidean geometry, constructions, non-Euclidean geometries and other topics in geometry. *Prerequisite: MA302*

**MA355 Number Theory & the History of Mathematics (3)**

This course is designed to acquaint the student with the widely known theorems, conjectures, unsolved problems and proofs of number theory. In addition, the history of mathematics, from the beginning of recorded civilization to the present, will be covered. Topics may include divisibility, primes, congruences, Diophantine equations and arithmetic functions. *Prerequisite: MA302*

**MA366 Probability (3)**

A general course in elementary probability theory. Topics to be covered may include the normal distribution, random variables, uni- and multi-variate probability distributions, and the Central Limit Theorem. *Prerequisite: MA221.*

**MA383 Complex Analysis (3)**

This course is an introduction to complex analysis. Topics to be covered may include complex numbers, analytic functions, elementary functions, integrals, Laurent series, residues, poles and applications of residues. *Prerequisite: MA302.*

**MA400 Mathematics Seminar (1)**

A lecture/discussion course reviewing recent articles appearing in mathematical journals accessible to undergraduate mathematics majors. May be repeated once for credit. This course is a capstone integrative course.

*Prerequisite: MA302.*

### **MA412 Integrated Review (1)**

A comprehensive review of the undergraduate mathematics curriculum for the purpose of preparing students for standardized examinations, such as the PRAXIS and the CSET (for prospective teachers), the GRE (for prospective graduate students), actuarial examinations (for prospective actuaries), and the senior subject examination in mathematics. This course is a capstone integrative course. *Prerequisite: Senior standing in Mathematics.*

### **MA425 Mathematical Modeling (3)**

This course covers the application of mathematical tools to enlighten and solve selected problems in the “real world.” Areas may include economics, finance, life sciences, computer science and physics. *Prerequisite: MA282.*

### **MA433 Partial Differential Equations (3)**

This course is an introduction to the subject of partial differential equations. Topics to be covered may include Fourier series and integrals, the heat equation, the wave equation, the potential equation, and Laplace Transforms. *Prerequisites: MA222 and MA282.*

### **MA445 Real Analysis I (3)**

The first semester of a unified course, this class covers topology in real space, the axioms of the real numbers, sequences, limits, continuity, convergence and differentiation. *Prerequisite: MA302.*

### **MA448 Real Analysis II (3)**

The optional second semester of a unified course, this class covers the Riemann integral, the inverse and implicit function theorems, integration and other advanced topics of calculus. This course is recommended for those students who are interested in pursuing graduate studies in mathematics. *Prerequisite: MA445.*

### **MA453 Abstract Algebra I (3)**

The first semester of a unified course, this class covers groups, homomorphisms, factor groups, isomorphisms and free groups. *Prerequisite: MA302.*

### **MA458 Abstract Algebra II (3)**

The optional second semester of a unified course, this class will cover rings, factor rings, fields, ideals, factorization, extension fields, automorphisms and elementary Galois Theory. This course is recommended for those students who are interested in pursuing graduate studies in mathematics. *Prerequisite: MA453.*

### **MA482 Topics in Mathematics (3)**

This course will consist of selected topics to be chosen by the professor. Since the content of this course changes

each year it may be repeated once for credit. *Prerequisite: Instructor approval.*

### **MA498 Tutorial Studies in Mathematics (1-3)**

Individual study under the guidance of a faculty member. *Prerequisite: Instructor approval.*