575   Senior Thesis   **1 hour**
Each student will critically review the thesis of another member of the class (peer review). They will make necessary revisions to their own senior theses after peer review and review by their faculty research mentors. They will also give a formal oral presentation of their research to the department, and attend presentations by invited speakers from industry and academia. Each student will also serve as a mentor to a junior who is preparing a presentation for CHM 475. To be taken in the spring of the senior year by biochemistry and chemistry majors who are seeking Departmental Honors or an ACS-certified degree. Prerequisite: CHM 570.

590   Chemical Research   **1-3 hours**
Laboratory and/or literature research in advanced chemistry, designed to develop independent research skills through the guidance of a research mentor on a specific chemical problem. Prerequisite: CHM 304.

597   Special Problems   **1-3 hours**
Investigation of special problems under faculty supervision. Prerequisite: Permission of the instructor.

598   Laboratory Assistantship   **1-2 hours**
Practical experience in setting up experiments and supervising laboratory work. Time requirement: three hours per week of laboratory work for each credit hour. Total limit: two hours of credit.

599   Assistantship Honors   **2 hours**

Mathematics

Chairman and Professor: THOMAS I. TRELOAR
Associate Professors: DAVID GAEBLER, RYAN HUTCHINSON, DAVID C. MURPHY,
     SAMUEL G. WEBSTER
Assistant Professors: KEVIN GERSTLE, MARK J. PANAGGIO
Lecturer: JONATHAN R. GREGG

The Department of Mathematics offers majors in mathematics and applied mathematics and a minor in mathematics.

Not only is mathematics, with its logical approach and precision, an important part of our culture in its own right, but it is also important for its numerous applications. For these reasons, courses are offered for those interested in the cultural values of the subject as well as for those who are interested in its applications.

All entering students are advised to take the core mathematics requirement in their first year. Whenever possible, students are placed in mathematics courses on the basis of their secondary school backgrounds and, when available, ACT or SAT scores in mathematics.

A field of concentration in mathematics requires a minimum of 29 semester hours. Mathematics 220, 310, 320, 403 and 410 are required. The remaining 12 hours are to be selected from three-hour mathematics courses at the 300 level or higher, at least three hours of which are selected from the 400 level or higher. Mathematics courses of one hour do not count toward the 12 hours of electives. Also, students majoring in mathematics are required to take the ETS mathematics major assessment test.

A minor in mathematics requires a minimum of 19 semester hours. Mathematics 120 (or 113), 220, and four elective courses (12 or 13 hours) selected from three-hour or four-hour mathematics courses numbered 300 or higher are required. Mathematics courses of one hour do not count toward the 12 hours of electives.

A field of concentration in applied mathematics requires a minimum of 29 semester hours. Mathematics 220, 310, 320, 370, 380, 406, and either 403 or 410 are required. The remaining six hours are to be selected from three-hour mathematics courses at the 300 level or higher, at least three hours of which are selected from the 400 level or higher. Mathematics courses of one hour do not count toward the 12 hours of electives. Also, students majoring in applied mathematics are required to take the ETS mathematics major assessment test.

A student majoring in mathematics may not major in applied mathematics. A student majoring in applied mathematics may not minor in mathematics.

Students majoring in mathematics or applied mathematics may select an honors thesis

option. Students who successfully complete this option will graduate with the designation of honors in mathematics or honors in applied mathematics. This option requires that a student have a 3.250 grade-point average in their mathematics major or applied mathematics major at the time of graduation. Also, beginning no later than the first semester of their senior year, the student must enroll in a Mathematics 575 honors thesis course for one or two hours (this course may be repeated once for a maximum of three hours in Mathematics 575 courses) and, in conjunction with this course, write a thesis in a mathematical field acceptable to the course instructor. In order to receive the honors designation, the student must receive a grade of "B" or better in each Mathematics 575 course and must give an oral presentation of his or her thesis to the Department.

For a pre-professional program in engineering, please consult pages 180-182.

TYPICAL SEQUENCE OF CLASSES FOR MATH MAJORS

YEAR	FALL SEMESTER	SPRING SEMESTER
1	Calculus I	Calculus II
2	Multivariable Calculus	Linear Algebra
3		Real Analysis
4	Abstract Algebra	

TYPICAL OFFERINGS OF MATHEMATICS ELECTIVES

FALL SEMESTER	SPRING SEMESTER
Non-Euclidean Geometry	Differential Equations and Dynamical Systems
Theory of Probability	Mathematical Logic
Complex Analysis	Theory of Numbers
History of Mathematics	Mathematical Modeling
Numerical Analysis	Game Theory
	Mathematical Statistics
	Topology

Topics in Mathematics (either semester)

Topics in Applied Mathematics (either semester)

Mathematics

105   Mathematics and Deductive Reasoning   **3 hours**
This course is designed to explore the nature of mathematics and give the student an introduction to logic and mathematical reasoning as a means for that investigation. The content may include Aristotelian logic and deductive reasoning, mathematical arguments and proof, and the study of axiomatic systems such as Euclidean geometry. Prerequisites: none..Fall and spring, every year.

112   Integrated Calculus I-A   **3 hours**
The first of a two-semester sequence designed to introduce the ideas and applications of the Differential Calculus. This course focuses on the concepts of functions, limits, continuity and differentiation, exploring them in the context of algebraic functions. Prerequisites: none. ....Fall, every year.

113   Integrated Calculus I-B   **3 hours**
The second of a two-semester sequence designed to introduce the ideas and applications of the Differential Calculus. This course focuses on the Differential Calculus of transcendental functions, including exponential, logarithmic and trigonometric functions. The course will introduce integration including the Fundamental Theorem of Calculus. The successful completion of MTH 113 is equivalent to successful completion of Calculus I. Prerequisites: MTH 112 with a grade of C- or better. ....Spring, every year.

120   Calculus I   **4 hours**
A comprehensive study of limits, continuity and differentiation of functions of one real variable and their applications. Introduction to integrals. Credit will not be granted for both MTH 113 and MTH 120. Prerequisites: For students in their first two years of college and an ACT mathematics score of 27 or higher...Fall and spring, every year.

220   Calculus II   **4 hours**
A continuation of MTH 120. Techniques and applications of integration. Infinite sequences and series. Prerequisite: MTH 113 or 120 with a grade of C- or better.....................................Fall and spring, every year.

303   Mathematical Logic   **3 hours**
A thorough treatment of the techniques of formal reasoning. Topics include truth-functional logic, quantification logic and construction of correct deductions. Prerequisite: MTH 105 or higher mathematics course... Spring, even-numbered years.

310   Linear Algebra   **3 hours**
The theory and applications of vector spaces, matrix algebra, linear transformations and eigenvalues. Prerequisite: MTH 220.. Fall and spring, every year.

320   Multivariable Calculus   **4 hours**
A third-semester calculus course. Topics will include vectors and three-dimensional coordinate systems, partial differentiation with applications, multiple integrals, and vector calculus. Prerequisite: MTH 220... Fall and spring, every year.

330   Theory of Numbers   **3 hours**
Properties of the integers, the Euclidean Algorithm, divisibility, Diophantine equations, prime numbers, congruences and residues. Prerequisite: MTH 220. .... Spring, odd-numbered years.

340   Differential Equations and Dynamical Systems   **3 hours**
A study of the techniques and theory of solving ordinary and partial differential equations. Topics may include series solutions, numerical methods, Fourier and Laplace transforms, linearization, stability theory, periodic orbits, and bifurcations and chaos. Prerequisite: MTH 310 or PHY 304................. Spring, typically odd-numbered years.

360   Non-Euclidean Geometry   **3 hours**
A college-level approach to Euclidean and non-Euclidean geometries. The course will pursue an in-depth investigation into the following topics: Hilbert's postulates for Euclidean geometry, the parallel postulates, neutral geometry and non-Euclidean geometry. Prerequisite: MTH 220..............Fall, odd-numbered years.

370   Theory of Probability   **3 hours**
Introduction to the mathematical theory of probability. Discrete probability spaces, conditional probability, discrete and continuous random variables, expectations and distributions. Prerequisite: MTH 320 .... Fall, every year.

375   Game Theory   **3 hours**
Game theory is the study of the interaction of rational decision makers. This course uses game theory to study incentives and strategic behavior in practical situations of inter-dependent decision making and negotiations. The course will develop basic theoretical concepts in tandem with applications from a variety of areas, including bargaining, competition, and strategic voting. Prerequisite: MTH 310 or MTH 320. …….................. ....Spring, typically even-numbered years.

380   Mathematical Modeling   **3 hours**
This course serves as an introduction to the formulation, analysis and interpretation of mathematical models in the study of problems in the natural, management and social sciences. Topics may include optimization, dimensional analysis, Markov chains and autonomous systems. The course will require the use of the Eaton Corporation Computer Laboratory and the software packages Minitab, Mathematica, and Matlab. Prerequisite: MTH 310. ....Spring, every year.

385   Financial Mathematics   **3 hours**
A course on mathematical interest theory. Topics discussed will include the time value of money, annuities and cash flows, loans, bonds, the yield rate of an investment, the term structure of interest rates, duration, and immunization. The course may also include topics from financial economics. Prerequisite: MTH 220 with a grade of C- or better.......... .... Offered as needed.

390   History of Mathematics   **3 hours**
A study of the historical development of various branches of mathematics from antiquity through the end of the nineteenth century. Topics include mathematics prior to classical antiquity, mathematics in ancient Greece, Islamic mathematics, the development of symbolic algebra, the invention of the calculus, and the nineteenth century evolution of algebra, geometry, and analysis. The course will emphasize primary source materials. Prerequisites: MTH 310 and 320. .... Fall, even-numbered years.

393   Seminar   **1-3 hours**
An introduction to proof writing, oral presentations, literature research, and computer software applied to mathematics. Prerequisite: MTH 220. ....Offered as needed.

403   Real Analysis   **3 hours**
A rigorous treatment of the calculus of one variable, including limits, continuity, sequences, differentiation and Riemann integrals. This course should be taken in the junior or senior year. Prerequisite: MTH 320 or permission of the instructor. ....Spring, every year.

405   Complex Analysis   **3 hours**
The theory of functions of a single complex variable. Complex numbers, elementary complex functions, differentiation and integration of complex functions, complex series and residue theory. Prerequisite: MTH 320. ...... Fall, even-numbered years.

406   Numerical Analysis   **3 hours**
Numerical methods for approximation of roots, systems of linear equations, interpolation and curve fitting, numerical integration and differentiation, and differential equations. Problems are generally approached through structured algorithms. Prerequisite: MTH 310 and 320. ....Fall, every year.

410   Abstract Algebra   **3 hours**
An introduction to the theory of algebraic structures, including the elementary properties of groups, rings and fields. This course should be taken in the junior or senior year. Prerequisite: MTH 310.Fall, every year.

415   Advanced Topics in Mathematics   **3 hours**
Further study of upper-level mathematics in areas including algebra, analysis, geometry, and dynamical systems. Please consult the Mathematics Department for course descriptions. Prerequisite: Consult instructor......... Offered as needed.

420   Mathematical Statistics   **3 hours**
This course serves as a sequel to MTH 370 (Theory of Probability), focusing on the application of concepts introduced in MTH 370 to the theory and practice of statistical inference. Emphasis will be placed both on the mathematical theory underlying the definition and evaluation of various estimators and statistical tests, as well as the application of this theory to the analysis of real-world data sets. Prerequisite: MTH 370. .... Spring, odd-numbered years.

425   Advanced Topics in Applied Mathematics   **3 hours**
Further study of upper-level mathematics in areas of applied mathematics. Please consult the Mathematics Department for course descriptions. Prerequisite: Consult instructor...................... Offered as needed.

430   Topology   **3 hours**
An introductory course in the fundamental concepts of general topology, including metric spaces, topological spaces, connectedness and compactness. Prerequisite: MTH 310. .... Spring, even-numbered years.

458   The Teaching of Elementary Mathematics   **1 hour**
A content-based course for the teaching of mathematics at the elementary level.......................... As needed.

459   The Teaching of Secondary Mathematics   **1 hour**
A content-based course for the teaching of mathematics at the secondary level........................... As needed.

575   Honors Thesis   **1-2 hours**
Investigation of a mathematical topic, under faculty supervision, leading to the honors thesis option in mathematics or applied mathematics. Prerequisite: permission of the instructor. ....Offered as needed.

597   Special Problems   **1-2 hours**
Investigation of special problems under faculty supervision. Prerequisite: permission of the instructor. ....Offered as needed.

Physics

Chairman and Professor: KENNETH G. HAYES
Professor: JAMES J. PETERS
Associate Professor: PAUL HOSMER
Assistant Professors: TIMOTHY DOLCH, RYAN LANG

Physics provides the fundamental understanding of all things in the natural world, from the smallest subatomic particles to the largest astronomical objects in the universe. Students of physics develop strong problem-solving and analytical skills. The knowledge and skills obtained from