MATHEMATICS (MAT)

College of the Sciences and Mathematics

Courses

MAT 500. Fundamentals of Applied Mathematics. 3 Credits.
This course is designed to provide an intense review of the core concepts essential to the study of
applied mathematics. Topics include the main theorems of differential and integral calculus;
techniques and theorems of vector analysis; sequences and power series; complex arithmetic
and elementary complex-valued functions; first-order, second-order, and systems of linear
differential equations; matrix algebra and vector spaces. The computer algebra systems
Matlab and Mathematica will be introduced as computational tools for these topics.
Typically offered in Fall, Spring & Summer.

MAT 503. History Of Mathematics. 3 Credits.
Contact department for more information about this course.

MAT 513. Linear Algebra. 3 Credits.
Vectors, vector spaces, determinants, linear transformations, matrices, and bilinear and
quadratic forms.
Pre / Co requisites: MAT 513 requires prerequisite of MAT 512.

MAT 514. Theory Of Numbers. 3 Credits.
Contact department for more information about this course.

MAT 515. Algebra I. 3 Credits.
Elements of abstract algebra, groups, commutative ring theory, modules, and associative
algebras over commutative rings. Offered in fall of odd-numbered years.

MAT 516. Algebra II. 3 Credits.
A continuation of MAT 515. Vector spaces, representation theory, and Galois theory.
Pre / Co requisites: MAT 516 requires prerequisite of MAT 515.
Typically offered in Spring.

MAT 517. Topics In Algebra. 3 Credits.
Contact department for more information about this course.
Repeatable for Credit.

MAT 521. Discrete Mathematics & Graph Theory. 3 Credits.
Contact department for more information about this course.

MAT 532. Geometry l. 3 Credits.
This course is a rigorous introduction to geometry from a transformational point of view,
emphasizing Euclidean, hyperbolic, and/or projective geometry. Other topics such as Spherical
geometry, symplectic geometry, or Affine geometry may be included if time permits.

MAT 533. Geometry II. 3 Credits.
A study of geometry using calculus as our main tool. The course covers the basics of differential
geometry: parametrizations, tangent spaces, curvature, geodesics; leading to Stokes theorem
and the Gauss-Bonnett theorem. Several examples will be studied in depth, including the
geometry: parametrizations, tangent spaces, curvature, geodesics; leading to Stokes theorem
and the Gauss-Bonnett theorem. Several examples will be studied in depth, including the
sphere and the projective plane (which were introduced in the first course).

MAT 535. Topology. 3 Credits.
This course is a rigorous introduction to point-set topology. Topics covered include topological
spaces and continuous functions, connectedness, compactness, separation axioms, metrization
theorems, and function spaces.
Typically offered in Summer.

MAT 536. Algebraic Topology. 3 Credits.
This course is an introduction to the fundamental techniques of algebraic topology. Topics
covered include fundamental groups and covering spaces, basic homological algebra,
simplicial homology, singular homology, and cohomology.
Typically offered in Summer.

MAT 541. Advanced Calculus. 3 Credits.
For students with background deficiencies in analysis. Ordinary and uniform limits; sequences
of functions; and the Riemann integral.
Typically offered in Summer.

MAT 543. Topics in Differential Equations. 3 Credits.
An advanced topics course. Existence and uniqueness theorems, stability theory, singular
points, regular singular points, Sturm separation theorem, and the “method of Liapunov.

MAT 545. Real Analysis I. 3 Credits.
A rigorous study of real-valued functions of real variables.
Typically offered in Fall.

MAT 546. Real Analysis II. 3 Credits.
Continuation of MAT 545.
Pre / Co requisites: MAT 546 requires prerequisite of MAT 545.
Typically offered in Spring.

MAT 548. Industrial Mathematics - Continuous Models. 3 Credits.
This course is designed to provide a survey of mathematical concepts, techniques, and
numerical algorithms used to study real-world continuous mathematical models. Application
areas include population dynamics, climatology, feedback and control systems, traffic flow,
diffusion, fluids and transport, and epidemiology. Computer software packages such as
Matlab, Mathematica, and Maple will be used in the analysis of the problems.
Pre / Co requisites: MAT 548 requires prerequisite of MAT 500.
Typically offered in Fall.

MAT 549. Industrial Mathematics - Discrete Models. 3 Credits.
This course is designed to provide a survey of mathematical concepts, techniques, and
numerical algorithms used to study real-world discrete mathematical models. Application
areas include forestation, particle dynamics, image processing, genetics, queues, efficient
call and traffic routing, and optimal scheduling. Computer software packages such as Matlab,
Mathematica, and Maple will be used in the analysis of the problems.
Pre / Co requisites: MAT 549 requires prerequisite MAT 500.
Typically offered in Spring.

MAT 552. Operations Research. 3 Credits.
This course provides an overview of deterministic operations research methodology including
linear, integer, nonlinear, and dynamic programming, and classical optimization problems.
The computer algebra system MATLAB and other software will be used as an investigative tool
in analyzing the problems that arise.
Pre / Co requisites: MAT 552 requires prerequisite of MAT 500.
Typically offered in Fall.

MAT 553. Stochastic Modeling. 3 Credits.
This course introduces topics in stochastic optimization and control (including Markov chains,
queueing theory, reliability theory, inventory theory, and forecasting), discrete-event and
Monte Carlo simulation, and stochastic differential equations. Applications are drawn from
manufacturing, finance, logistics, and service systems. The computer algebra system MATLAB
and other software will be used as an investigative tool in analyzing these models.
Pre / Co requisites: MAT 553 requires prerequisite of MAT 500.
Typically offered in Spring.

MAT 554. Scientific Computing. 3 Credits.
This case-study driven course will illustrate the use of computational tools in multiple science
and engineering domains. The focus is on using MATLAB and appropriate numerical methods
(including solutions of linear and nonlinear algebraic equations, solutions of ordinary and
partial differential equations, finite elements, linear programming, optimization algorithms,
and fast-Fourier transforms) to assist in investigating mathematical models of phenomena in
the physical, ecological, and financial realms.
Pre / Co requisites: MAT 554 requires prerequisite of MAT 500.
Typically offered in Fall.

MAT 555. Industrial Practicum - Continuous Models. 3 Credits.
This is a case study, team problem-solving based course focused on solving real-world
problems that can be modeled using continuous mathematics techniques and that emanate
from industry. Ideally, the problems would be obtained from partnerships with local industry
and they will ordinarily focus on topics arising in optimization, financial mathematics, and
other stochastic models.
Pre / Co requisites: MAT 555 requires prerequisites of MAT 548, MAT 549, and one of MAT 552,
MAT 553 or MAT 554.
Typically offered in Fall.

MAT 556. Industrial Practicum - Discrete Models. 3 Credits.
This is a case study, team problem-solving based course focused on solving real-world
problems that can be modeled using discrete mathematics techniques and that emanate
from industry. Ideally, the problems would be obtained from partnerships with local industry
and they will ordinarily focus on topics arising in the biological, natural, and physical sciences.
Pre / Co requisites: MAT 556 requires prerequisites of MAT 548, MAT 549, and at least one of
the following: MAT 552, MAT 553, or MAT 554.
Typically offered in Spring.

MAT 570. Math Models In Life, Phys & Soc Sciences. 3 Credits.
Contact department for more information about this course.
MAT 575. Complex Analysis I. 3 Credits.
Contact department for more information about this course.

MAT 583. Operations Research & Applied Mathematics. 3 Credits.
Contact department for more information about this course.
Typically offered in Fall & Spring.

MAT 595. Topics in Mathematics. 1-3 Credits.
Topics announced at time of offering.
Consent: Permission of the Department required to add.
Repeatable for Credit.

MAT 599. Independent Study. 1-3 Credits.
Contact department for more information about this course.

MAT 609. Thesis I. 3 Credits.
Conduct literature search, develop thesis proposal and begin research under the guidance of a mathematics department faculty member.

MAT 610. Thesis II. 3-6 Credits.
Contact department for more information about this course.