

The College of Arts and Sciences

DEPARTMENT OF MATHEMATICS

Head of the Department: Professor Pedersen

Professors: DeAlwis, Dugopolski

Associate Professor: Golding, Gray, Li, Merino, O'Callaghan, Reyes, R. Wills

Assistant Professors: Acosta, Cannon, Gurney, Hatch, L. Kabza, Lewallen, Neuerburg, Roegner

Instructors: Brown, Carona, Clifton, Guidroz, Jenkins, Kirkpatrick, Miller, Muller, A.Wills

MATHEMATICS (MATH)

No credit will be given for any 100- level mathematics course taken subsequent to a 200-level course with the exception of Math 241 without permission of the Department Head of Mathematics. Under special circumstances, the Department Head may grant permission for a student who does not meet the prerequisites for a course to take that course.

¹ May not be used for a major or minor in Mathematics. For the purpose of certification in secondary education, this course is considered below the calculus level.

160. Explorations in College Algebra. Credit 3 hours. Prerequisites: A score of 18 or above on the Mathematics section of the Enhanced ACT, DVMA 92, or an appropriate score on the Developmental Placement Test. A study of college algebra from a real-world perspective using technology, data analysis, geometry, and elementary probability. Topics include linear, quadratic, and exponential functions and their graphs; systems of linear equations; ratio and proportion; probability and statistics; and the mathematics of finance. A graphing calculator is required for this course.

161. College Algebra. Credit 3 hours. Prerequisite: A score of 18 or above on the Mathematics section of the Enhanced ACT, DVMA 92, or an appropriate score on the Developmental Mathematics Placement Test. A study of families of functions and their graphs. The families of functions studied will include linear, quadratic, polynomial, rational, exponential, and logarithmic. These families of functions will be used to model and solve real world applications. A graphing calculator is required for this course.

161H. Honors College Algebra. Credit 3 hours. Prerequisite: Authorization of the Director of the Honors Program. A study of families of functions, conic sections, and sequences and series. The

families of functions studied will include linear, quadratic, polynomial, rational, exponential, and logarithmic. These functions will be used to model and solve real world problems with the aid of calculators and computers. Emphasis will be placed on the communication of solutions to problems and mathematical ideas through oral presentations and writing. A graphing calculator is required for this course.

162. Plane Trigonometry. Credit 3 hours. Prerequisites: Math 160 or Math 161. The study of trigonometric functions. Topics include the laws of sine and cosine, the trigonometric functions and their graphs, inverse trigonometric functions, trigonometric identities and equations, complex numbers, graphs of parametric equations and graphs in polar coordinates. Trigonometry and trigonometric functions will be used to model and solve real world applications. A graphing calculator is required for this course.

163. Calculus for the Biological, Business and Social Sciences. Credit 3 hours. Prerequisite: Math 161. An introduction to differential and integral calculus designed for students majoring in business, biology, psychology, industrial technology, economics, and other social sciences. Topics include limits, the first and second derivative, the first and second derivative tests for relative extrema, the definite and indefinite integral, and the Fundamental Theorem of Calculus. Calculus will be used to solve real world applications. A graphing calculator is required for this course.

165. Precalculus with Trigonometry. Credit 3 hours. Prerequisite: Math 161 or Enhanced ACT mathematics score of 22 or higher. Topics will include a study of conic sections, general quadratic equations, systems of linear and general quadratic equations, exponential, logarithmic, and rational functions, properties and applications of trigonometric functions. A graphing calculator is required for this course.

167 [261]. Elementary Number Structure. Credit 3 hours. Prerequisite: Math 160 or Math 161. Basic concepts of fractions, decimals, percentage, geometry, computational facility, number theory and problem solving. This course may not be used to satisfy the General Education requirements.

168. ¹ Geometry for Elementary and Middle School Teachers. Credit 3 hours. Prerequisite: Math 167. This course is designed to prepare the student to teach the geometry of the K-8 curriculum. Topics include basic concepts and properties of two- and three-dimensional space: perimeter, area, volume, parallelism, perpendicularity, congruence, similarity, transformations and constructions. This course may not be used to satisfy the General Education requirements.

182. Mathematics of Finance. Credit 3 hours. Prerequisite: Math 160 or Math 161. An introduction to financial mathematics. Topics include simple and compound interest, annuities, amortization, sinking funds, bonds, depreciation, life annuities. A graphing calculator is required for this course.

185. Contemporary Mathematics. Credit 3 hours. Prerequisite: Math 160 or Math 161. An introduction to topics in contemporary mathematics. Topics may be selected from the theory of finance, perspective and symmetry in art, formal Aristotelian logic, graph theory, probability and odds, elementary number theory, optimization, numeracy in the real world, and historical topics in mathematics that have influenced contemporary mathematics. A graphing calculator is required for

this course.

200. Calculus I. Credit 5 hours. Prerequisites: A score of 27 or above on the Mathematics section of the Enhanced ACT and permission of the Department Head OR Math 165. The first of a standard three-course sequence on the foundations of differential and integral calculus. Topics include limits, the derivatives of elementary functions, approximation of definite integrals using Riemann sums, and applications of the derivative. Calculus will be used in the solution of real world applications. A graphing calculator is required for this course.

201. Calculus II. Credit 5 hours. Prerequisite: Math 200. The second of a standard three-course sequence on calculus. Topics include integration techniques, applications of the definite integral, and infinite series. Calculus will be used in the solution of real world applications. A graphing calculator is required for this course.

207. Computer Calculus. Credit 1 hour. Prerequisite: Credit for Mathematics 200 or 163. A course designed to use computer techniques to develop and illustrate the topics of calculus.

208. Computer Mathematics. Credit 3 hours. Prerequisite: Math 201. A course designed to illustrate the use of the computer in developing mathematical concepts and solving mathematical problems, especially those arising from calculus. The computer will be used to aid in the solution of real world applications.

223. Foundations of Discrete Mathematics. Credit 3 hours. Prerequisite: Math 200. This course is designed to introduce students to the techniques of writing mathematical proofs. Topics include logic, quantified statements, elementary number theory, sets, and functions and relations.

241. Elementary Statistics. Credit 3 hours. Prerequisite: Math 160 or Math 161. Graphical display of data, measures of central tendency and variability, sampling theory, the normal curve, standard scores, Student's T, Chi Square, and correlation techniques. A graphing calculator is required for this course. Students may not receive credit for both Math 241 and Math 267.

267. Data Analysis with Probability. Credit 3 hours. Prerequisite: Math 168. This course is designed to introduce and develop the basic concepts of probability and data analysis, and to examine the role of probability in statistical thinking. Topics include probability, data collection and representation, measures of central tendency and variability, the normal curve, standard scores, correlation and regression, and the use of statistics in making predictions and generalizations. A graphing calculator is required for this course. Note: the pedagogical techniques modeled in this course are especially useful for students interested in teaching in the K-8 curriculum. Students may not receive credit for both Math 241 and Math 267. **309. College Geometry.** Credit 3 hours. Prerequisite: Math 200. A study of axiomatic systems, advanced Euclidean geometry, hyperbolic geometry, and geometric transformations.

311. History of Mathematics. Credit 3 hours. Prerequisite: Mathematics 200. A survey of the history of mathematics from ancient times. Mathematical topics studied include number bases, Pythagorean triples, figurative numbers, construction of tangent lines to curves, and solutions of cubic and quartic

equations.

312. Calculus III. Credit 3 hours. Prerequisite: Math 201. The third of a standard three-course sequence on calculus. Topics include vectors and geometry of 3-space, vector-valued functions, directional derivatives, and multiple and line integrals. A graphing calculator is required for this course.

350 [401]. Applied Differential Equations. Credit 3 hours. Prerequisite: Math 201. An introduction to differential equations with an emphasis on conceptual ideas and the use of computer algebra systems in solving real-world application problems. Solutions of differential equations will be found symbolically, graphically, and numerically. Topics will include linear first order equations, higher order equations, linear systems of equations, nonlinear systems, and chaos in dynamical systems.

360. Applied Linear Algebra. Credit 3 hours. Prerequisites: Math 201 and Math 223 or concurrent enrollment. An introduction to linear algebra from a conceptual standpoint. Emphasis will be put on working in R^2 and R^3 . Topics will include matrices and systems of equations, determinants, vector spaces, and linear transformations.

370. Introduction to Abstract Algebra. Credit 3 hours. Prerequisites: Math 201 and Math 223 or concurrent enrollment. An introduction to abstract algebra concentrating on elementary group theory. Topics will include cyclic groups, abelian groups, symmetric groups, and other groups of low order. Subgroups, centralizers, and homomorphisms will also be discussed.

380. Applied Statistics with Probability. Credit 3 hours. Prerequisite: Math 163 or Math 200. An introduction to data analysis and the use of computer software packages to organize, summarize, and analyze data. Discussion will include the basic rules of probability, commonly used discrete and continuous distributions, random sampling and sampling distributions, regression analysis, parameter estimation, hypothesis testing, and analysis of variance techniques.

383. Independent Projects in Mathematics. Credit 1-6 hours. Prerequisites: Junior standing, 2.5 adjusted grade point average, and permission of the Department Head. An opportunity for students to apply mathematics in a specific assignment under the direction of a faculty member of the Department of Mathematics. Specific assignments may include, but are not limited to, projects and/or service learning opportunities in business, industry, commercial, governmental or educational agencies. This course may be taken/repeated for a maximum of 6 hours credit. This course cannot be used to satisfy mathematics requirements for any degree program.

391. Internship in Mathematics. Credit 3-12 hours. Prerequisites: Junior standing, 2.5 adjusted grade point average, and permission of the Department Head. Internship in mathematics provides a student with experience in the application of mathematics in an assignment selected and approved by the University with a cooperating business, industry, governmental or educational setting. Credit hours are earned at a rate of one semester hour for each 40 hours of approved work experience. The course may be taken/repeated for a maximum of 12 hours credit. This course cannot be used to satisfy mathematics requirements in any degree program.

402/506. Differential Equations. Credit 3 hours. Prerequisite: Math 312 and Math 350. Course on solutions of systems of linear ordinary differential equations, techniques of Laplace transforms and infinite series in solving ordinary differential equations, method of separation of variables in solving partial differential equations, Fourier series, and special functions.

407/507. Topics in Mathematics. Credit 3 hours. Prerequisite: Permission of the Department Head. Contemporary topics in mathematics and mathematics education. Credit for this course may be acquired more than once. Maximum credit six hours.

409/509. Linear Algebra. Credit 3 hours. Prerequisite: Math 360. Course on vector spaces, bases, inner-products, linear transformations and their matrix representations, traces, determinants, Cayley-Hamilton Theorem, nonsingularity, and applications which include solving systems of linear equations.

410/510. Theory of Numbers. Credit 3 hours. Prerequisite: Math 201 and Math 223. An introduction to the properties of integers, number congruences, multiplicative functions, primitive roots, and quadratic residues.

414/514. Fundamental Concepts of Geometry. Credit 3 hours. Prerequisite: Math 201 and Math 223. Deductive methods in mathematics; origins and development of concepts of geometry including geometric transformations, transformation groups and hyperbolic, elliptical and real projective geometry.

417/517. Mathematical Statistics. Credit 3 hours. Prerequisites: Math 223 and Math 312. Basic mathematics of statistics from a prerequisite of calculus. Basic concepts of probability, properties of discrete and continuous distributions.

421/523. Abstract Algebra. Credit 3 hours. Prerequisite: Math 370. A course on groups, rings, integral domains, ideals, ring homomorphisms, and fields.

427/527. Introduction to Topology. Credit 3 hours. Prerequisites: Math 223 and Math 312. An introduction to point-set topology and metric spaces. Topics include topological spaces, topological equivalency, metric spaces, compact spaces, connected spaces, Hausdorff spaces, and separation theorems.

431/533. Numerical Analysis. Credit 3 hours. Prerequisite: Math 350 and Computer Science 280. Numerical methods for solving nonlinear equations and systems of linear equations, approximations of functions by polynomial and spline interpolations, and numerical solutions of differential equations.

441/544. Real Analysis. Credit 3 hours. Prerequisite: Math 223 and Math 312. A rigorous study of calculus. Topics include the ϵ - δ approach to limits, sequences, continuity, the derivative, and the Riemann integral.

450/550. Complex Analysis. Credit 3 hours. Prerequisites: Math 223 and Math 312. A course on the

theory of functions of a single complex variable. Topics may include algebraic operations of complex numbers, elementary functions, limits, analytic functions, Cauchy-Riemann equations, antidifferentiation, contour integrals, Cauchy's theorem, residues, poles, and infinite series.

460/560. Secondary Mathematics Methods. Credit 3 hours. Prerequisites: Math 223 and Math 350 or Math 360 or Math 370. This course offers techniques of teaching mathematics at the secondary level. Topics include an analysis of the main ideas of algebra, geometry, trigonometry, and elementary calculus in the secondary mathematics curriculum. Also, possible materials and technologies to be used in this curriculum will be investigated. Class time will involve discussions, demonstrations, and other activities. There will also be on-site observations and participation in secondary mathematics classrooms. Students majoring or minoring in mathematics in the College of Arts and Sciences may not use this course as a 400 level mathematics elective.

494/594. Introduction to Reading and Research in Mathematics. Credit 1-3 hours. Prerequisite: Permission of the Head of the Department of Mathematics. A course devoted to research in selected areas of mathematics. Course may be repeated for up to six hours total credit.

495/595. Introduction to Reading and Research in Mathematics. Credit 1-3 hours. Prerequisite: Permission of the Head of the Department of Mathematics. A course devoted to research in selected areas of mathematics. Course may be repeated for up to six hours total credit.