MATHEMATICS (MAT)

MAT SCE Senior Capstone Experience 2 Credits
The Senior Capstone Experience in mathematics consists of two components: a senior thesis and either an oral presentation of the thesis in front of the faculty and majors at seminar, or a poster presentation. Comprehensive exams may be offered in place of a traditional senior thesis. The Senior Capstone Experience in mathematics is graded as Pass, Fail, or Honors. Students must do a thesis and make an oral presentation to earn the grade of honors.
Term(s) Offered: All Terms, All Years

MAT 102 Chaos and Fractals 4 Credits
This course is an introduction to the rapidly developing science of complexity. It is a discussion of the tools-fractals, chaos, and self-organization-being refined for the purpose of understanding such things as the fractured and irregular structures of Nature, surprise and unpredictability, and the emergence of lifelike properties from inanimate matter. The theme of the course is that complexity can arise from simple origins, such as the repeated application of elementary processing rules. The course emphasizes the use of the computer for visualization. Practical application of these ideas in medicine and engineering will be discussed, as will examples of the connections between complexity in the sciences and that in the humanities and the arts.
Cross-listed as: MAT 120/MAT 102
Term(s) Offered: Other, Non Conforming

MAT 104 Finite Mathematics 4 Credits
Linear programming, matrices, sets and counting, Markov process, difference equations, and graphs. The course emphasizes developing, analyzing, and interpreting mathematical models.
Term(s) Offered: Other, Non Conforming

MAT 105 Communication, Patterns & Inventions 4 Credits
This course is designed for students in the Elementary Education Certification Program and for students planning to complete the Secondary Education Certification Program in an area other than mathematics. The framework of the course consists of four themes: Number Systems and their Operations, Algebra and Functions, Geometry and Measurement, Data Analysis, Statistics, and Probability. Emphasis throughout is on reasoning and problem-solving using concepts and procedures from all four areas. Substantial amounts of both reading and writing is required and students are expected to demonstrate both orally and in writing a thorough understanding of the concepts and the ability to communicate this understanding to others.
Cross-listed as: MAT 105/MAT 221
Term(s) Offered: Other, Non Conforming

MAT 106 Stretch Differential Calculus I 4 Credits
Analytic geometry, the derivative and differential, elementary functions, limits, continuity, and applications. This course is part 1 (of 2) of a yearlong sequence in differential calculus. At the end of this two-course sequence, students tackle all the topics above included in differential calculus. Completion of this year-long sequence is equivalent to completion of MAT 111: Differential Calculus. Please note, Pre-Calculus placement score must be less than 50 to take this course. Also note, MAT 106 and MAT 107 can be counted as a two-course quantitative sequence for distribution, but MAT 106 and 107 do not count as a quantitative course otherwise.
Term(s) Offered: Fall, All Years

MAT 107 Stretch Differential Calculus II 4 Credits
This course is the second semester of a year-long sequence in Differential Calculus. Topics in this course include trigonometry, derivatives of trigonometric functions, conic sections, implicit differentiation, and limits at infinity. The semester concludes with the Fundamental Theorem of Calculus. Throughout the semester, students work on a project involving Calculus, culminating in a final paper and a presentation. Completion of this year-long sequence is equivalent to completion of MAT 111: Differential Calculus. Also note, MAT 106 and MAT 107 can be counted as a two-course quantitative sequence for distribution, but MAT 106/107 does not count as a quantitative course otherwise.
Term(s) Offered: Spring, All Years

MAT 109 Statistical Inference & Data Analysis I 4 Credits
Introduction to the theory and practice of data analysis and statistics in the natural and social sciences. Statistical software will be used. Topics will include data ethics, sampling, experimental design, descriptive statistics, conditional probability, the normal distribution, simple linear regression, confidence intervals, hypothesis tests, and decisions. Credit for MAT 109 will not be given if taken before or subsequently to BUS 109, PSY 209, or ECN 215.
Term(s) Offered: All Terms, All Years

MAT 111 Differential Calculus 4 Credits
Analytic geometry, the derivative and differential, elementary functions, limits, continuity, and applications. Prerequisite: It is strongly recommended that a student should have strong algebra and trigonometric skills before taking this course.
Cross-listed as: MAT 111/MAT 201
Term(s) Offered: All Terms, All Years

MAT 112 Integral Calculus 4 Credits
The indefinite integral, the definite integral, the fundamental theorem of the integral calculus, sequences, series, and applications.
Cross-listed as: MAT 202/MAT 112
Term(s) Offered: All Terms, All Years

MAT 194 Special Topics 4 Credits
Topics not regularly offered in a department's normal course offerings, chosen based on current student interest and faculty expertise. Special topic courses can only be offered 3 times; after this, the course must be approved as a regular course. Graded A-F or Pass/Fail.
Term(s) Offered: All Terms, All Years

MAT 195 On-Campus Research 4 Credits
An agreement between a sponsoring faculty member and a student researching a topic of interest that is relevant to a student's major or minor. Research is conducted on campus. Students must be enrolled before the research can begin. Graded A-F or Pass/Fail. 45 hours are required per credit.

MAT 196 Off-Campus Research 4 Credits
An agreement between a sponsoring faculty member and a student researching a topic of interest that is relevant to a student's major or minor. Research is conducted off-campus. Students must be enrolled before the research can begin. Graded A-F or Pass/Fail. 45 hours are required per credit.
Term(s) Offered: Summer, All Years

MAT 197 Independent Study 4 Credits
An agreement between a sponsoring faculty and a student letting the student study a topic of interest not offered at WC. 45 hours are required per credit.

MAT 209 Statistical Inference & Data Analysis II 4 Credits
A continuation of the theory and practice of data analysis and statistics in the natural and social sciences. Use of statistical software constitutes a significant part of this course. Common statistical mistakes and the careful and ethical application of statistical methods are emphasized. Topics include experimental design, multivariate linear regression, non-parametric and parametric inference, power calculations, logistic regression, chi-squared tests, and ANOVA.
Term(s) Offered: Spring, All Years

MAT 210 Multivariable Calculus 4 Credits
Vectors, partial derivatives, and multiple integrals for functions of several variables. Line and surface integrals.
Cross-listed as: MAT 203/MAT 210
Term(s) Offered: Fall, All Years

MAT 220 Data Science 4 Credits
The heart of data science is going from a deluge of numbers to ever-elusive insight. In this introduction we focus on first principles: asking good questions, being aware of our assumptions, and understanding what it means to do good science. Topics include exploratory analysis/descriptive statistics, statistical testing, and data visualization. The course concludes with an introduction to recent data-driven machine learning models. We discuss ethical issues pertaining to data and machine learning throughout the course, using current events and articles as they arise. The course is both math and programming intensive, although in a heavily applied manner.
Cross-listed as: CSI 220/MAT 220
Term(s) Offered: Fall, All Years

MAT 230 Foundations of Geometry 4 Credits
A critical study of the basic concepts of geometry. This course begins with an axiomatic approach to Euclidean geometry which includes careful proofs of its principal theorems. The course will continue with an examination of various types of non-Euclidean geometries which may include spherical geometry, projective geometry, and/or hyperbolic geometry.
Term(s) Offered: Other, Non Conforming

MAT 240 Discrete Mathematics 4 Credits
An introduction to logic, reasoning, and the discrete mathematical structures that are important in computer science. Topics include proposition logic, types of proof, induction and recursion, sets, combinatorics, functions, relations, and graphs.
Cross-listed as: MAT 240/CSI 240
Term(s) Offered: All Terms, All Years

MAT 252 Scientific Modeling & Data Analysis 4 Credits
This course serves as a focused introduction to programming for scientists and engineers. Topics include algorithm development, statistical tests, the fast Fourier transform (FFT), simulating the dynamics of systems represented by coupled ordinary differential equations (e.g. planetary motion via Runge-Kutta methods), numerical integration, root finding, fitting functions to experimental data, and the creation of publication-quality graphics. Students choose and complete an independent research project on a topic related to their major. This course enables students to integrate computation into advanced courses in theoretical and/or experimental science. Programming language: Python.
Cross-listed as: PHY 252/MAT 252/CSI 252
Term(s) Offered: Spring, All Years

MAT 280 Linear Algebra 4 Credits
An introduction to linear algebra balancing computation and the reading, understanding, and writing of mathematical proofs. A selection of topics from systems of linear equations, matrices, vector spaces, bases, dimension, linear transformations, determinants, eigenvalues, change of basis, matrix representations of linear transformations, matrix decompositions, and applications of linear algebra. It is recommended that students take MAT 240 before this course.
Cross-listed as: MAT 325/MAT 280
Term(s) Offered: Spring, All Years

MAT 294 Special Topics 4 Credits
Topics not regularly offered in a department's normal course offerings, chosen based on current student interest and faculty expertise. Special topic courses can only be offered 3 times; after this, the course must be approved as a regular course. Graded A-F or Pass/Fail.
Term(s) Offered: All Terms, All Years

MAT 295 On-Campus Research 4 Credits
An agreement between a sponsoring faculty member and a student researching a topic of interest that is relevant to a student's major or minor. Research is conducted on campus. Students must be enrolled before the research can begin. Graded A-F or Pass/Fail. 45 hours are required per credit.

MAT 296 Off-Campus Research 4 Credits
An agreement between a sponsoring faculty member and a student researching a topic of interest that is relevant to a student's major or minor. Research is conducted off-campus. Students must be enrolled before the research can begin. Graded A-F or Pass/Fail. 45 hours are required per credit.
Term(s) Offered: Summer, All Years

MAT 297 Independent Study 4 Credits
An agreement between a sponsoring faculty and a student letting the student study a topic of interest not offered at WC. 45 hours are required per credit.

MAT 310 Differential Equations 4 Credits
Elementary methods for the solution of ordinary differential equations, including the expansion of the solution in an infinite series.
Cross-listed as: MAT 310/MAT 345
Term(s) Offered: Spring, All Years

MAT 320 Probability 4 Credits
Events and their probabilities, dependence, and independence. Bayes Theorem. Variates and expected values. Theorems of Bernoulli and De Moivre. Special distributions. Central limit theorem and applications.
Cross-listed as: MAT 318/MAT 320
Term(s) Offered: Other, Non Conforming

MAT 330 Complex Analysis 4 Credits
Theory of functions of a complex variable, including applications to problems in the theory of functions of a real variable. Cauchy's Integral Formula and its application to the calculus of residues.
Cross-listed as: MAT 316/MAT 330
Term(s) Offered: Other, Non Conforming

MAT 340 Numerical Analysis 4 Credits
Solution of equations and systems of equations by iteration and elimination, numerical differentiation and integration, assessment of accuracy, methods of interpolation and extrapolation.
Cross-listed as: MAT 340/CSI 340
Term(s) Offered: Other, Non Conforming

MAT 350 Graph Theory & Combinatorics 4 Credits
This course introduces elementary combinatorial techniques used to enumerate large but finite discrete sets, including some of the following: permutations, the binomial theorem, partitions, bijections, and well-known sequences. It also presents the fundamentals of graph theory: trees, networks, paths and connectivity, matchings, colorings, and optimization algorithms. There is a significant proof-writing component plus computations and opportunities for coding.
Cross-listed as: CSI 350/MAT 350
Term(s) Offered: Other, Non Conforming

MAT 370 Operations Research 4 Credits
This course tackles challenges that arise in the functioning (operations) of a complex organization, and then works to formulate, analyze, and solve corresponding mathematical decision models. Some of these challenges might involve distributing tasks among processes competing for limited resources, arranging transportation between hubs to minimize cost, or scheduling employees' shifts to meet demands while lowering payroll costs. We develop mathematical and computational tools, understand how they work, and explore some of their historic usage in industry. Topics include some combination of: linear programming & the simplex method; transportation & assignment problems; network models; dynamic programming; integer programming.
Cross-listed as: Mat 370/CSI 370
Term(s) Offered: Other, Non Conforming

MAT 380 Number Theory 4 Credits
Factorization of integers. Congruences and residue classes. Theorems of Euler, Fermat, Wilson, and Gauss. Primitive roots. Quadratic residues and the reciprocity theorem.
Cross-listed as: MAT 380/MAT 360
Term(s) Offered: Other, Non Conforming

MAT 390 Mathematics Internship 4 Credits
A learning contract is developed prior to enrollment in an internship. Evaluation of student performance is completed by the faculty mentor based on the fulfillment of the contract terms and written evaluation by the internship site supervisor. Students must work at least 45 hours for each internship credit and be enrolled in the course prior to beginning work. Graded A-F or Pass/Fail.
Term(s) Offered: All Terms, All Years

MAT 391 Junior Math Major Seminar I 1 Credit
Open to mathematics majors only. Weekly meetings of the majors and faculty in the department are scheduled to provide information about careers, graduate school, thesis topics, and research areas, as well as to prepare each major to make presentations of problem solutions and to make the required presentation on the thesis. All junior mathematics majors are enrolled in the seminar and will receive a pass/fail grade at the end of the semester. Junior standing, and permission of the Department.
Term(s) Offered: Fall, All Years

MAT 392 Junior Math Major Seminar II 1 Credit
Open to mathematics majors only. Weekly meetings of the majors and faculty in the department are scheduled to provide information about careers, graduate school, thesis topics, and research areas, as well as to prepare each major to make presentations of problem solutions and to make the required presentation on the thesis. All junior mathematics majors are enrolled in the seminar and will receive a pass/fail grade at the end of the semester. Junior standing, and permission of the Department.
Term(s) Offered: Spring, All Years

MAT 394 Special Topics 4 Credits
Topics not regularly offered in a department's normal course offerings, chosen based on current student interest and faculty expertise. Special topic courses can only be offered 3 times; after this, the course must be approved as a regular course. Graded A-F or Pass/Fail.
Term(s) Offered: All Terms, All Years

MAT 395 Summer Research 4 Credits
An agreement between a sponsoring faculty member and a student researching a topic of interest that is relevant to a student's major or minor. Research is conducted on campus. Students must be enrolled before the research can begin. Graded A-F or Pass/Fail. 45 hours are required per credit.

MAT 396 Off-Campus Research 4 Credits
An agreement between a sponsoring faculty member and a student researching a topic of interest that is relevant to a student's major or minor. Research is conducted off-campus. Students must be enrolled before the research can begin. Graded A-F or Pass/Fail. 45 hours are required per credit.
Term(s) Offered: Summer, All Years

MAT 397 Independent Study 4 Credits
An agreement between a sponsoring faculty and a student letting the student study a topic of interest not offered at WC. 45 hours are required per credit.

MAT 410 Abstract Algebra 4 Credits
Introduction to groups, rings and fields. Other topics may include integral domains, polynomial rings, and fields.
Cross-listed as: MAT 322/MAT 410
Term(s) Offered: Fall, Odd Years

MAT 470 Real Analysis I 4 Credits
A rigorous treatment of single-variable calculus. A selection of topics from the properties and the topology of the real numbers, sequences, series, continuity, differentiation, and Riemann integration.
Cross-listed as: MAT 311/MAT 470
Term(s) Offered: Fall, Even Years

MAT 480 Real Analysis II 4 Credits
A continuation of Real Analysis II. Topics selected according to student and instructor interest. Topics could include analysis in metric spaces, analysis in n-dimensional space, Fourier analysis, functional analysis, measure theory, and Lebesgue integration. Suitable for engineers, chemists, physicists, economists, and mathematicians.
Term(s) Offered: Other, Non Conforming

MAT 490 Mathematics Internship 4 Credits
A learning contract is developed prior to enrollment in an internship. Evaluation of student performance is completed by the faculty mentor based on the fulfillment of the contract terms and written evaluation by the internship site supervisor. Students must work at least 45 hours for each internship credit and be enrolled in the course prior to beginning work. Graded A-F or Pass/Fail.
Term(s) Offered: All Terms, All Years

MAT 491 Senior Math Major Seminar I 1 Credit
Open to mathematics majors only. Senior students make a presentation of a preliminary outline of their capstone project in the fall semester and present a report on the completed capstone project in the spring. All senior mathematics majors are enrolled in the seminar and receive a pass/fail grade at the end of the semester.
Term(s) Offered: Fall, All Years

MAT 492 Senior Math Major Seminar II 1 Credit
Open to mathematics majors only. Senior students make a presentation of a preliminary outline of their capstone project in the fall semester and present a report on the completed capstone project in the spring. All senior mathematics majors are enrolled in the seminar and receive a pass/fail grade at the end of the semester.
Term(s) Offered: Spring, All Years

MAT 494 Special Topics 4 Credits
Topics not regularly offered in a department's normal course offerings, chosen based on current student interest and faculty expertise. Special topic courses can only be offered 3 times; after this, the course must be approved as a regular course. Graded A-F or Pass/Fail.
Term(s) Offered: All Terms, All Years

MAT 495 On-Campus Research 4 Credits
An agreement between a sponsoring faculty member and a student researching a topic of interest that is relevant to a student's major or minor. Research is conducted on campus. Students must be enrolled before the research can begin. Graded A-F or Pass/Fail. 45 hours are required per credit.

MAT 496 Off-Campus Research 4 Credits
An agreement between a sponsoring faculty member and a student researching a topic of interest that is relevant to a student's major or minor. Research is conducted off-campus. Students must be enrolled before the research can begin. Graded A-F or Pass/Fail. 45 hours are required per credit.
Term(s) Offered: Summer, All Years

MAT 497 Independent Study 4 Credits
An agreement between a sponsoring faculty and a student letting the student study a topic of interest not offered at WC. 45 hours are required per credit.