# Computer Science

**Department of Mathematics and Computer Science**

**Department Chair:** Stephanie Costa

**Computer Science Program Faculty: Associate Professors** Ravenscroft Jr., Sarawagi; **Assistant Professors** El Fouly, Hamouda, Liu, Mello-Stark

Students **must** consult with their assigned advisor before they will be able to register for courses. *Note:* Students may not count toward the major more than two courses with grades below C-.

Computer Science B.A.

Course Requirements

Courses

|  |  |  |  |
| --- | --- | --- | --- |
| CSCI 211 | Computer Programming and Design | 4 | F, Sp |
| CSCI 212 | Data Structures | 4 | F, Sp |
| CSCI 312 | Computer Organization and Architecture I | 4 | F, Sp |
| CSCI 313 | Computer Organization and Architecture II | 3 | F, Sp |
| CSCI 325 | Organization of Programming Language | 3 | F (even years), Sp |
| CSCI 401 | Software Engineering | 3 | F (even years), Sp |
| CSCI 423 | Analysis of Algorithms | 4 | F (odd years), Sp |
| CSCI 435 | Operating Systems and Computer Architecture | 3 | F, Sp (even years) |

THREE COURSES from

|  |  |  |  |
| --- | --- | --- | --- |
| CSCI 305 | Functional Programming | 4 | F |
| CSCI 415 | Software Testing | 4 | F (even years) |
| CSCI 416 | Human-Computer Interaction Design | 4 | As needed |
| CSCI 422 | Introduction to Computation Theory | 4 | Sp (As needed) |
| CSCI 427 | Introduction to Artificial Intelligence | 3 | As needed |
| CSCI 437 | Network Architectures and Programming | 4 | As needed |
| CSCI 455 | Introduction to Database Systems | 3 | F (odd years) |
| CSCI 467 | Computer Science Internship | 4 | As needed |
| CSCI 476 | Advanced Topics in Computer Science | 4 | Sp |

Cognates

|  |  |  |  |
| --- | --- | --- | --- |
| MATH 212 | Calculus I | 4 | F, Sp, Su |
| MATH 436 | Discrete Mathematics | 3 | F, Sp |

IT IS RECOMMENDED that students also take:

|  |  |  |  |
| --- | --- | --- | --- |
| COMM 208 | Public Speaking | 4 | F, Sp |
| ENGL 230 | Writing for Professional Settings | 4 | F, Sp, Su |
| MATH 209 | Precalculus Mathematics | 4 | F, Sp, Su |
| MATH 213 | Calculus II | 4 | F, Sp, Su |
| MATH 315 | Linear Algebra | 4 | F |

Total Credit Hours: 44-47

Computer Science B.S.

Course Requirements

Courses

|  |  |  |  |
| --- | --- | --- | --- |
| CSCI 211 | Computer Programming and Design | 4 | F, Sp |
| CSCI 212 | Data Structures | 4 | F, Sp |
| CSCI 312 | Computer Organization and Architecture I | 4 | F, Sp |
| CSCI 313 | Computer Organization and Architecture II | 3 | F, Sp |
| CSCI 325 | Organization of Programming Language | 3 | F (even years), Sp |
| CSCI 401 | Software Engineering | 3 | F (even years), Sp |
| CSCI 423 | Analysis of Algorithms | 4 | F (odd years), Sp |
| CSCI 435 | Operating Systems and Computer Architecture | 3 | F, Sp (even years) |

THREE COURSES from

|  |  |  |  |
| --- | --- | --- | --- |
| CSCI 305 | Functional Programming | 4 | F |
| CSCI 415 | Software Testing | 4 | F (even years) |
| CSCI 416 | Human-Computer Interaction Design | 4 | As needed |
| CSCI 422 | Introduction to Computation Theory | 4 | Sp (As needed) |
| CSCI 427 | Introduction to Artificial Intelligence | 3 | As needed |
| CSCI 437 | Network Architectures and Programming | 4 | As needed |
| CSCI 455 | Introduction to Database Systems | 3 | F (odd years) |
| CSCI 467 | Computer Science Internship | 4 | As needed |
| CSCI 476 | Advanced Topics in Computer Science | 4 | Sp |

Cognates

|  |  |  |  |
| --- | --- | --- | --- |
| ENGL 230 | Writing for Professional Settings | 4 | F, Sp, Su |
|  | -Or- |  |  |
| ENGL 231 | Writing for Digital and Multimedia Environments | 4 | As needed |
|  |   |  |  |
| MATH 212 | Calculus I | 4 | F, Sp, Su |
| MATH 213 | Calculus II | 4 | F, Sp, Su |
|  |   |  |  |
| MATH 240 | Statistical Methods I | 4 | F, Sp, Su |
|  | -Or- |  |  |
| MATH 248 | Business Statistics I | 4 | F, Sp, Su |
|  |   |  |  |
| MATH 436 | Discrete Mathematics | 3 | F, Sp |
| PHIL 206 | Ethics | 3 | F, Sp, Su |
|  |   |  |  |

ONE COURSE from

|  |  |  |  |
| --- | --- | --- | --- |
| MATH 300 | Bridge to Advanced Mathematics | 4 | Sp |
| MATH 314 | Calculus III | 4 | F, Sp |
| MATH 324 | College Geometry | 4 | F, Sp |
| MATH 417 | Introduction to Numerical Analysis | 4 | Sp (as needed) |
| MATH 418 | Introduction to Operations Research | 3 | Sp (even years) |
| MATH 431 | Number Theory | 3 | F, Sp |
| MATH 445 | Advanced Statistical Methods | 4 | Sp |

ONE OF THE FOLLOWING TWO-COURSE SEQUENCES

|  |  |  |  |
| --- | --- | --- | --- |
| BIOL 111 | Introductory Biology I | 4 | F, Sp, Su |
|  | -And- |  |  |
| BIOL 112 | Introductory Biology II | 4 | F, Sp, Su |
|  |   |  |  |
|  | -Or- |  |  |
|  |   |  |  |
| CHEM 103 | General Chemistry I | 4 | F, Sp, Su |
|  | -And- |  |  |
| CHEM 104 | General Chemistry II | 4 | F, Sp, Su |
|  |   |  |  |
|  | -Or- |  |  |
|  |   |  |  |
| PHYS 101 | Physics for Science and Mathematics I | 4 | F, Sp, Su |
|  | -And- |  |  |
| PHYS 102 | Physics for Science and Mathematics II | 4 | F, Sp, Su |

FOUR ADDITIONAL CREDIT HOURS in biology, chemistry, physical sciences, or physics at the 200-level or above.

Note: Connections courses cannot be used to satisfy these requirements.

Note: Eight credit hours from BIOL 111; CHEM 103; MATH 212, MATH 240; or PHYS 101 may be counted toward the Natural Science and Mathematics categories of General Education.

Total Credit Hours: 74-78

Computer Science Minor

Course Requirements

The minor in computer science consists of a minimum of 21 credit hours (six courses), as follows:

Courses

|  |  |  |  |
| --- | --- | --- | --- |
| CSCI 211 | Computer Programming and Design | 4 | F, Sp |
| CSCI 212 | Data Structures | 4 | F, Sp |
| CSCI 312 | Computer Organization and Architecture I | 4 | F, Sp |

and three additional computer science courses (9-12 credits).

Total Credit Hours: 21-24

# Computer Science

**Department of Mathematics and Computer Science**

**Department Chair:** Stephanie Costa

**Computer Science Program Faculty: Associate Professors** Ravenscroft Jr., Sarawagi; **Assistant Professors** El Fouly, Hamouda, Liu, Mello-Stark

Students **must** consult with their assigned advisor before they will be able to register for courses. *Note:* Students may not count toward the major more than two courses with grades below C-.

Computer Science B.A.

Course Requirements

Courses

|  |  |  |  |
| --- | --- | --- | --- |
| CSCI 211 | Computer Programming and Design | 4 | F, Sp |
| CSCI 212 | Data Structures | 4 | F, Sp |
| CSCI 312 | Computer Organization and Architecture I | 4 | F, Sp |
| CSCI 313 | Computer Organization and Architecture II | 3 | F, Sp |
| CSCI 325 | Organization of Programming Language | 3 | F (even years), Sp |
| CSCI 401 | Software Engineering | 3 | F (even years), Sp |
| CSCI 423 | Analysis of Algorithms | 4 | F (odd years), Sp |
| CSCI 435 | Operating Systems and Computer Architecture | 3 | F, Sp (even years) |

THREE COURSES from

|  |  |  |  |
| --- | --- | --- | --- |
| CSCI 305 | Functional Programming | 4 | F |
| CSCI 415 | Software Testing | 4 | F (even years) |
| CSCI 416 | Human-Computer Interaction Design | 4 | As needed |
| CSCI 422 | Introduction to Computation Theory | 4 | Sp (As needed) |
| CSCI 427 | Introduction to Artificial Intelligence | 3 | As needed |
| CSCI 437 | Network Architectures and Programming | 4 | As needed |
| CSCI 455 | Introduction to Database Systems | 3 | F (odd years) |
| CSCI 467 | Computer Science Internship | 4 | As needed |
| CSCI 476 | Advanced Topics in Computer Science | 4 | Sp |

Cognates

|  |  |  |  |
| --- | --- | --- | --- |
| MATH 212 | Calculus I | 4 | F, Sp, Su |
| MATH 436 | Discrete Mathematics | 3 | F, Sp |

IT IS RECOMMENDED that students also take:

|  |  |  |  |
| --- | --- | --- | --- |
| COMM 208 | Public Speaking | 4 | F, Sp |
| ENGL 230 | Writing for Professional Settings | 4 | F, Sp, Su |
| MATH 209 | Precalculus Mathematics | 4 | F, Sp, Su |
| MATH 213 | Calculus II | 4 | F, Sp, Su |
| MATH 315 | Linear Algebra | 4 | F |

Total Credit Hours: 44-47

Computer Science B.S.

Course Requirements

Courses

|  |  |  |  |
| --- | --- | --- | --- |
| CSCI 211 | Computer Programming and Design | 4 | F, Sp |
| CSCI 212 | Data Structures | 4 | F, Sp |
| CSCI 312 | Computer Organization and Architecture I | 4 | F, Sp |
| CSCI 313 | Computer Organization and Architecture II | 3 | F, Sp |
| CSCI 325 | Organization of Programming Language | 3 | F (even years), Sp |
| CSCI 401 | Software Engineering | 3 | F (even years), Sp |
| CSCI 423 | Analysis of Algorithms | 4 | F (odd years), Sp |
| CSCI 435 | Operating Systems and Computer Architecture | 3 | F, Sp (even years) |

THREE COURSES from

|  |  |  |  |
| --- | --- | --- | --- |
| CSCI 305 | Functional Programming | 4 | F |
| CSCI 415 | Software Testing | 4 | F (even years) |
| CSCI 416 | Human-Computer Interaction Design | 4 | As needed |
| CSCI 422 | Introduction to Computation Theory | 4 | Sp (As needed) |
| CSCI 427 | Introduction to Artificial Intelligence | 3 | As needed |
| CSCI 437 | Network Architectures and Programming | 4 | As needed |
| CSCI 455 | Introduction to Database Systems | 3 | F (odd years) |
| CSCI 467 | Computer Science Internship | 4 | As needed |
| CSCI 476 | Advanced Topics in Computer Science | 4 | Sp |

Cognates

|  |  |  |  |
| --- | --- | --- | --- |
| ENGL 230 | Writing for Professional Settings | 4 | F, Sp, Su |
|  | -Or- |  |  |
| ENGL 231 | Writing for Digital and Multimedia Environments | 4 | As needed |
|  |   |  |  |
| MATH 212 | Calculus I | 4 | F, Sp, Su |
| MATH 213 | Calculus II | 4 | F, Sp, Su |
|  |   |  |  |
| MATH 240 | Statistical Methods I | 4 | F, Sp, Su |
|  | -Or- |  |  |
| MATH 248 | Business Statistics I | 4 | F, Sp, Su |
|  |   |  |  |
| MATH 436 | Discrete Mathematics | 3 | F, Sp |
| PHIL 206 | Ethics | 3 | F, Sp, Su |
|  |   |  |  |

ONE COURSE from

|  |  |  |  |
| --- | --- | --- | --- |
| MATH 300 | Bridge to Advanced Mathematics | 4 | Sp |
| MATH 314 | Calculus III | 4 | F, Sp |
| MATH 324 | College Geometry | 4 | F, Sp |
| MATH 417 | Introduction to Numerical Analysis | 4 | Sp (as needed) |
| MATH 418 | Introduction to Operations Research | 3 | Sp (even years) |
| MATH 431 | Number Theory | 3 | F, Sp |
| MATH 445 | Advanced Statistical Methods | 4 | Sp |

ONE OF THE FOLLOWING TWO-COURSE SEQUENCES

|  |  |  |  |
| --- | --- | --- | --- |
| BIOL 111 | Introductory Biology I | 4 | F, Sp, Su |
|  | -And- |  |  |
| BIOL 112 | Introductory Biology II | 4 | F, Sp, Su |
|  |   |  |  |
|  | -Or- |  |  |
|  |   |  |  |
| CHEM 103 | General Chemistry I | 4 | F, Sp, Su |
|  | -And- |  |  |
| CHEM 104 | General Chemistry II | 4 | F, Sp, Su |
|  |   |  |  |
|  | -Or- |  |  |
|  |   |  |  |
| PHYS 101 | Physics for Science and Mathematics I | 4 | F, Sp, Su |
|  | -And- |  |  |
| PHYS 102 | Physics for Science and Mathematics II | 4 | F, Sp, Su |

FOUR ADDITIONAL CREDIT HOURS in biology, chemistry, physical sciences, or physics at the 200-level or above.

Note: Connections courses cannot be used to satisfy these requirements.

Note: Eight credit hours from BIOL 111; CHEM 103; MATH 212, MATH 240; or PHYS 101 may be counted toward the Natural Science and Mathematics categories of General Education.

Total Credit Hours: 74-78

Computer Science Minor

Course Requirements

The minor in computer science consists of a minimum of 21 credit hours (six courses), as follows:

Courses

|  |  |  |  |
| --- | --- | --- | --- |
| CSCI 211 | Computer Programming and Design | 4 | F, Sp |
| CSCI 212 | Data Structures | 4 | F, Sp |
| CSCI 312 | Computer Organization and Architecture I | 4 | F, Sp |

and three additional computer science courses (9-12 credits).

Total Credit Hours: 21-24

# Mathematics

**Department of Mathematics and Computer Science**

**Department Chair:** Stephanie Costa

**Mathematics Program Faculty: Professors** Abrahamson, Costa, Humphreys, La Ferla, Sparks, Teixeira, Zhou; **Associate Professors** Burke, Christy, Gall, Harrop, Kovac, Sarawagi; **Assistant Professors** Caswell, Medwid, Pinheiro, Roy, Turki, Wang

Students **must** consult with their assigned advisor before they will be able to register for courses.

*Note: Students cannot count toward the major more than two courses with grades below C-.*

Mathematics B.A.

Course Requirements

Courses

|  |  |  |  |
| --- | --- | --- | --- |
| MATH 212 | Calculus I | 4 | F, Sp, Su |
| MATH 213 | Calculus II | 4 | F, Sp, Su |
| MATH 300 | Bridge to Advanced Mathematics | 4 | Sp |
| MATH 314 | Calculus III | 4 | F, Sp |
| MATH 315 | Linear Algebra | 4 | F |
| MATH 411 | Calculus IV | 4 | F (odd years) |
|  |   |  |  |
| MATH 416 | Ordinary Differential Equations | 4 | Sp (as needed) |
|  | -Or- |  |  |
| MATH 417 | Introduction to Numerical Analysis | 4 | Sp (as needed) |
|  |   |  |  |
| MATH 432 | Introduction to Abstract Algebra | 4 | Sp |
| MATH 441 | Introduction to Probability | 4 | F |
| MATH 461 | Seminar in Mathematics | 3 | Sp |

TWO COURSES from

|  |  |  |  |
| --- | --- | --- | --- |
| MATH 416 | Ordinary Differential Equations | 4 | Sp (as needed) |
|  | -Or- |  |  |
| MATH 417 | Introduction to Numerical Analysis | 4 | Sp (as needed) |
|  |   |  |  |
| MATH 418 | Introduction to Operations Research | 3 | Sp (even years) |
| MATH 431 | Number Theory | 3 | F, Sp |
| MATH 436 | Discrete Mathematics | 3 | F, Sp |
| MATH 445 | Advanced Statistical Methods | 4 | Sp |

Cognates

CHOOSE category A or B below

Category A

ONE COURSE from

|  |  |  |  |
| --- | --- | --- | --- |
| CHEM 405 | Physical Chemistry I | 3 | F |
| CSCI 312 | Computer Organization and Architecture I | 4 | F, Sp |
| CSCI 422 | Introduction to Computation Theory | 4 | Sp (As needed) |
| CSCI 423 | Analysis of Algorithms | 4 | F (odd years), Sp |
| ECON 314 | Intermediate Microeconomic Theory and Applications | 4 | F |
| ECON 315 | Intermediate Macroeconomic Theory and Analysis | 4 | Sp |
| MGT 249 | Business Statistics II | 4 | F, Sp, Su |
| MKT 333 | Market Research | 4 | F, Sp |
| PHIL 305 | Intermediate Logic | 4 | Sp (even years) |

Category B

|  |  |  |  |
| --- | --- | --- | --- |
| PHYS 101 | Physics for Science and Mathematics I | 4 | F, Sp, Su |

and either

|  |  |  |  |
| --- | --- | --- | --- |
| CSCI 211 | Computer Programming and Design | 4 | F, Sp |
|  | -Or- |  |  |
| PHYS 102 | Physics for Science and Mathematics II | 4 | F, Sp, Su |

Prior to enrolling in any mathematics course above 120, all students must have completed the College Mathematics Competency.

Total Credit Hours: 48-54

# MGT - Management

MGT 201 - Foundations of Management (4)

Management concepts are explained, including planning, organizing, leading, and controlling. Students develop managerial communication skills by working with groups. (Formerly MGT 301)

Prerequisite: Completion of at least 45 college credits.

Offered: Fall, Spring, Summer.

MGT 249 - Business Statistics II (4)

A continuation of MATH 248, emphasis is on applied statistics, both parametric and nonparametric..

Prerequisite: MATH 240 or MATH 248.

Offered: Fall, Spring, Summer.

MGT 306 - Management of a Diverse Workforce (4)

Topics include contemporary paradigms, cultural issues, and rationales for managing a diverse workplace. Individual approaches, conflicts, and organizational responses are examined.

Prerequisite: MGT 201 or MGT 301.

Offered: Spring.

# MATH - Mathematics

MATH 010 - Basic Mathematics Competency (4)

Satisfactory completion of this course fulfills the College Mathematics Competency. Topics include problem solving, beginning algebra, geometry, measurement, introductory probability and statistics, and graphs and charts. Graded S, U.

Offered: Fall, Spring, Summer.

MATH 117 - Calculus: A Short Course (3)

Topics include differentiation and integration, including an introduction to partial differentiation.

Offered: As needed.

MATH 120 - Intermediate Algebra (4)

Intended for students needing intermediate algebra skills, especially for MATH 177 and 209. Topics include linear and quadratic equations, inequalities, exponents, radicals, algebraic fractions, and quadratic, logarithmic and exponential functions.

Prerequisite: MATH 010 or appropriate score on the placement exam.

Offered: Fall, Spring, Summer.

MATH 139 - Contemporary Topics in Mathematics (4)

Areas of modern mathematics that have application in contemporary society are introduced. Topics include the mathematics of social science, graph theory, consumer mathematics, and statistics.

General Education Category: Mathematics.

Prerequisite: Completed college mathematics competency or appropriate score on the mathematics placement exam.

Offered: Fall, Spring, Summer.

MATH 143 - Mathematics for Elementary School Teachers I (4)

Emphasis is on problem solving, model building, and algorithm development appropriate for the mathematics curriculum in the elementary/middle school. Topics include numeration and the development of number systems. Lecture and laboratory.

Prerequisite: Completed college mathematics competency or appropriate score on the mathematics placement exam.

Offered: Fall, Spring, Summer.

MATH 144 - Mathematics for Elementary School Teachers II (4)

A continuation of MATH 143, this course includes geometry and measurement, counting problems, probability, and statistics. Lecture and laboratory.

General Education Category: Mathematics for elementary education students only.

Prerequisite: MATH 143, with a minimum grade of C, or consent of department chair.

Offered: Fall, Spring, Summer.

MATH 177 - Quantitative Business Analysis I (4)

Topics include linear and selected nonlinear functions, linear systems, matrix methods, linear programming, average rate of change, derivatives and marginal analysis. Applications to management and economics are stressed throughout.

General Education Category: Mathematics.

Prerequisite: MATH 120 or appropriate score on placement exam.

Offered: Fall, Spring, Summer.

MATH 209 - Precalculus Mathematics (4)

The functions, concepts, and techniques of algebra and trigonometry considered essential in the study and applications of calculus are introduced and/or reinforced.

General Education Category: Mathematics.

Prerequisite: MATH 120 or appropriate score on placement exam.

Offered: Fall, Spring, Summer.

MATH 210 - College Trigonometry (3)

This is an in-depth study of trigonometry. Topics include a comprehensive analysis of trigonometric and inverse trigonometric functions and solutions of triangles, vectors, and polar coordinates.

Prerequisite: Three units of college preparatory mathematics and MATH 120 or consent of department chair.

Offered: Spring.

MATH 212 - Calculus I (4)

This course covers the fundamental concepts, techniques, and applications of the differential calculus of one variable and begins the study of integration.

General Education Category: Mathematics.

Prerequisite: MATH 209 or appropriate score on placement exam.

Offered: Fall, Spring, Summer.

MATH 213 - Calculus II (4)

A continuation of MATH 212, topics include derivatives and integrals of logarithmic, exponential, and inverse trigonometric functions; techniques of integration; infinite series; and related applications.

General Education Category: Advanced Quantitative/Scientific Reasoning.

Prerequisite: MATH 212

Offered: Fall, Spring, Summer.

MATH 220 - Formalizing Mathematical Thought (4)

This course is an introduction to abstract and generalized thinking including formal mathematical proof. Students cannot receive credit for MATH 220 if credit was received for MATH 300.

Prerequisite: MATH 143, MATH 144, and MATH 209.

Offered: Fall.

MATH 238 - Quantitative Business Analysis II (3)

Elementary differential calculus and partial differentiation are studied, with applications to management. Students cannot receive credit for both MATH 238 and MATH 212.

Prerequisite: MATH 177 or MATH 209.

Offered: Fall, Spring, Summer.

MATH 239 - Contemporary Topics in Mathematics II (4)

Topics studied include, and are not limited to: applications to management, electoral politics and fair and equitable conflict resolution.

General Education Category: Advanced Quantatitive/Scientific Reasoning.

Prerequisite: MATH 139 or consent of department chair.

Offered: Fall, Spring, Summer.

MATH 240 - Statistical Methods I (4)

Descriptive statistics; confidence intervals and hypothesis testing; random variables; estimations and tests of significance; and correlation and regression are studied. Students cannot receive credit for both MATH 240 and MATH 248.

General Education Category: Mathematics.

Prerequisite: Completed college mathematics competency or appropriate score on the mathematics placement exam.

Offered: Fall, Spring, Summer.

MATH 241 - Statistical Methods II (4)

Continuation of MATH 240 at elementary level. Covers analysis of variance, multiple regression, and non-parametric statistics. Emphasis on large data sets being analyzed through computer software, and interpretation of results. Students cannot receive credit for both MATH 241 and MGT 249, nor for MATH 241 if credit was received for MATH 445.

General Education Category: Advanced Quantitative/Scientific Reasoning

Prerequisite: MATH 240

Offered: As needed.

MATH 245 – Principles of Data Science (4)

**Students will be introduced to statistical computing using an appropriate software package. Topics include techniques for visualizing and managing data, statistical modeling including regression, and ANOVA.**

**Prerequisite: MATH 240.**

**Offered: Fall, Spring.**

MATH 248 - Business Statistics I (4)

Topics include descriptive statistics, probability distributions, expected values, sampling distributions, and an introduction to estimation and hypothesis testing. Students cannot receive credit for both MATH 240 and MATH 248.

General Education Category: Gen. Ed. Advanced Quantitative/Scientific Reasoning.

Prerequisite: MATH 177 or consent of department chair.

Offered: Fall, Spring, Summer.

MATH 300 - Bridge to Advanced Mathematics (4)

The standard techniques of deductive proof in mathematics are applied to basic results regarding sets, relations, functions, and other topics.

Prerequisite: MATH 213 or consent of department chair.

Offered: Spring.

MATH 314 - Calculus III (4)

A continuation of MATH 213, this course covers three-dimensional analytic geometry, elementary vector analysis, functions of several variables, partial differentiation, and multiple integration.

Prerequisite: MATH 213.

Offered: Fall, Spring.

MATH 315 - Linear Algebra (4)

Matrices, linear systems, vector spaces, vector geometry, linear transformations, and appropriate applications are covered.

Prerequisite: MATH 300, with a minimum grade of C.

Offered: Fall.

MATH 324 - College Geometry (4)

Advanced topics in Euclidean geometry are considered using synthetic, analytic, vector, and transformational formats. Included are axiomatics and non-Euclidean geometry, topics in logic, and methods of proof appropriate for geometry.

General Education Category: Advanced Quantitative/Scientific Reasoning.

Prerequisite: MATH 212.

Offered: Fall, Spring.

Math 345 – Linear Models for Data Science (4)

Students will apply matrix theory to the study and implementation of linear models to problems in data science. Topics include basic matrix theory with applications to optimization, and machine learning.

Prerequisite: **MATH 315 or both MATH 245 and MATH 212.**

**Offered: Fall.**

MATH 409 - Mathematical Problem Analysis (4)

Problem-solving strategies in mathematics are identified. The level of problems and their analyses is designed to give students confidence in their ability to handle problems and a basis for the teaching of problem analysis.

Prerequisite: MATH 143, MATH 144, and either MATH 209 or consent of department chair.

Offered: Fall.

MATH 411 - Calculus IV (4)

A continuation of MATH 314, study includes Lagrange multipliers, line integrals, Green's Theorem, transformations and the Jacobian, and an introduction to analysis involving limits and the derivative.

Prerequisite: MATH 314.

Offered: Fall (odd years).

MATH 416 - Ordinary Differential Equations (4)

The fundamentals of differential equations are studied in the context of applications. Topics include analytical and numerical solutions of first- and second-order equations, systems of equations, and modeling.

Prerequisite: Prior or concurrent enrollment in MATH 314.

Offered: Spring (as needed).

MATH 417 - Introduction to Numerical Analysis (4)

Algorithms and computer programs are used/developed to solve various mathematical problems. Topics include numerical solutions of equations, numerical differentiation and integration, and interpolation and approximation of functions.

Prerequisite: MATH 213 and one computer science course, or consent of department chair.

Offered: Spring (as needed).

MATH 418 - Introduction to Operations Research (3)

Operations research is the systematic application of mathematical techniques for generating better decisions for real-world problems. Besides linear programming, topics may include queuing and network analysis.

Prerequisite: MATH 212 or consent of department chair.

Offered: Spring (even years).

MATH 431 - Number Theory (3)

Topics include number systems, divisibility, primes and factorization, Diophantine problems, congruences, and Euler's and Fermat's Theorems.

Prerequisite: MATH 212.

Offered: Fall, Spring.

MATH 432 - Introduction to Abstract Algebra (4)

The definitions and properties of groups, rings, and fields are studied. Properties of familiar number systems are exhibited as special cases of these more general and abstract systems.

Prerequisite: MATH 315.

Offered: Spring.

MATH 436 - Discrete Mathematics (3)

Several important areas in noncontinuous mathematics are introduced, including graph theory and its applications, difference equations, and finite-state machines.

Prerequisite: MATH 212.

Offered: Fall, Spring.

MATH 441 - Introduction to Probability (4)

Topics include the development of both discrete and continuous probability theory, combinatorics, mathematical expectation, joint distributions, and sampling distributions.

Prerequisite: MATH 314.

Offered: Fall.

MATH 445 - Advanced Statistical Methods (4)

Students will be introduced to methods that are necessary to analyze large data sets commonly encountered in data science and statistics.

Prerequisite: **MATH 345, or MATH 315, or both MATH 436 and prior or concurrent enrollment in CSCI 423.**

Offered: Spring.

MATH 458 - History of Mathematics (4)

The history of mathematical thought and the development of mathematics from ancient to modern times are studied.

Prerequisite: MATH 300, with a minimum grade of C.

Offered: Fall.

MATH 461 - Seminar in Mathematics (3)

Students analyze, synthesize and expand on mathematics learned in preceding courses, culminating in a substantial project and presentation.

Prerequisite: MATH 441 and prior or concurrent enrollment in MATH 432.

Offered: Spring.

MATH 490 - Directed Study in Mathematics (3)

This course is open to students who have demonstrated superior ability in mathematics. Designed to be a substitute for a traditional course under the instruction of a faculty member. This course may be repeated for credit once with a change in content.

Prerequisite: Consent of instructor, department chair and dean.

Offered: As needed.

MATH 491 - Independent Study in Mathematics (1)

This course is open to students who have demonstrated superior ability in mathematics. Students select a topic and undertake concentrated research or creative activity mentored by a faculty member. This course may be repeated for credit once with a change in content.

Prerequisite: Consent of instructor, department chair and dean.

Offered: As needed.

MATH 512 - Foundations of Higher Analysis (3)

Fundamental concepts in the theory of calculus are presented. Topics include limits, continuity and uniform continuity, differentiation, the Riemann integral, sequences and series, and convergence criteria.

Prerequisite: Graduate status, MATH 300 and MATH 314.

Offered: As needed.

MATH 515 - Introduction to Complex Variables (3)

Techniques and concepts of the algebra and calculus of functions of one complex variable are studied, including trigonometric, exponential, and logarithmic functions.

Prerequisite: Graduate status, prior or concurrent enrollment in MATH 314.

Offered: As needed.

MATH 519 - Set Theory (3)

The foundations of set theory and logic are studied in the context of their application in the construction of number systems, from the natural numbers through the reals.

Prerequisite: Graduate status, MATH 300, MATH 314, MATH 432, or consent of department chair.

Offered: As needed.

MATH 528 - Topology (3)

Study is made of sets and sequences, various topological spaces, including metric, compactness, connectedness, curves, and mappings.

Prerequisite: Graduate status, MATH 300 and MATH 314.

Offered: As needed.

MATH 532 - Algebraic Structures (3)

Selected topics in the development of groups, rings, modules, and fields are covered, including homomorphisms, permutation groups, basic Galois Theory, ring extension problems, and ideals.

Prerequisite: Graduate status, MATH 300, MATH 315, MATH 432.

Offered: As needed.

MATH 551 - Topics in Proof (3)

Varying topics in mathematical proof are examined, from number systems and functions to abstract spaces.

Prerequisite: Graduate status and consent of department chair.

Offered: As needed.

MATH 552 - Topics in Applied Mathematics (3)

Varying topics in applied mathematics are examined, from numerical and analytical investigations to modeling.

Prerequisite: Graduate status and consent of department chair.

Offered: As needed.

MATH 553 - Topics in Pure Mathematics (3)

Varying topics in pure mathematics are examined, from number theory and advanced geometries to abstract algebra.

Prerequisite: Graduate status and consent of department chair.

Offered: As needed.