CS 335 - Networking/Network Admin (Credits: 4)
An introductory examination of the Open System Interconnection Reference Model (OSI). Topics covered include network architecture, data flow control, transmission control, path control, recovery, and routing techniques. Prerequisite: CS 162. Student must have at least sophomore standing to register for this course.

CS 360 - Object-Orient Prog With C++ (Credits: 4)
A study of object oriented programming with C++. Beginning and intermediate concepts are covered including classes, objects, member functions, overloading, inheritance, polymorphism, templates, and virtual functions. Prerequisite: CS 221, 260. Student must have at least sophomore standing to register for this course.

CS 369 - Mobile Application Development (Credits: 4)
Development of applications for phones, tablets, and other mobile devices, with an emphasis on the constraints facing mobile application design and development from both a hardware and user perspective. Introduction to current mobile app frameworks, events, and user interfaces. Prerequisites: CS 360.

CS 380 - Software Engineering (Credits: 3)
Emphasis is on the specification, organization, implementation, testing, and documentation of software. Inherent problems, challenges, tools, and methods of a large software project. Presents methods and tools used in the various stages of software production. This course should prepare students for the problems they will encounter as software professionals. Prerequisite: CS 260, CS 315. Student must have at least sophomore standing to register for this course.

CS 381 - Programming Languages (Credits: 4)
Concepts of high-level programming languages. Syntax and semantics of several existing languages. Compilers, interpreters and formal syntax specification. Prerequisite: CS 360. Student must have at least sophomore standing to register for this course.

CS 401 - Capstone (Credits: 1 to 6)
Institutional Graduation Requirement - UWR Prerequisite: Upper-division standing or consent of instructor. Student must have at least junior standing to register for this course.

CS 407 - Seminar (Credits: 1 to 6)
Student must have at least junior standing to register for this course.

CS 409 - Practicum (Credits: 1 to 12)
Students gain practical experience in a professional or pre-professional setting. Prerequisites: Upper-division standing and consent of instructor. Student must have at least junior standing to register for this course.

CS 410 - Selected Topics (Credits: 1 to 5)
An in-depth presentation of a topic of interest to both students and faculty. Topics will vary from year to year depending on the interests and availability of faculty. Prerequisites: May be required for some topics. Student must have at least junior standing to register for this course.

CS 425 - Computer Graphics (Credits: 4)
This course studies the principles underlying the generation and display of 3-D computer graphics. Topics include geometric transformations, 3-D viewing and projection, lighting and shading, color, camera models and interaction, and standard graphics APIs. Prerequisites: CS 221 and junior standing.

CS 440 - Artificial Intelligence (Credits: 4)
Basic concepts of intelligent systems and artificial intelligence programming, representation, control, communication, and perception. Prerequisites: CS 318, CS 360, and junior standing.

EASTERN OREGON UNIVERSITY
Mathematics

PROGRAM OBJECTIVES
The program in mathematics has three primary objectives:
- To provide a major in mathematics that develops the attitude of mind and analytical skills required for effective use and understanding of mathematics.
- To provide a major which prepares students for a variety of career choices, including graduate study, industrial and business careers, and secondary school teaching. Within teaching, more generally, to prepare highly qualified teachers of mathematics for elementary, middle and secondary schools.
- To provide the necessary mathematical and statistical support courses for students in other disciplines, including computer science, physical and biological sciences, social science, business and economics, and health.

LEARNING OUTCOMES
Graduates from the Mathematics Program will have demonstrated proficiency in the following four areas:
- Content Knowledge: demonstrate a broad-based knowledge of mathematical content and technique.
• Problem Solving: demonstrate problem-solving skills in the context of mathematics, and the ability to apply techniques learned in the study of specific topics in new areas.

• Inquiry and Analysis: employ the skills of independent, careful analysis of mathematical exposition.

• Communication: use written and oral communication skills appropriate to mathematical exposition.

MEANS OF ASSESSMENT
Means of outcomes assessment include midterm and comprehensive final examinations, homework exercises and quizzes, individual and group projects, classroom presentations, term papers and a capstone project. For example, students generally demonstrate their mastery of fundamental areas of mathematics through performance on examinations. Skills in logical reasoning are demonstrated by constructing rigorous proofs of mathematical theorems, or constructing counterexamples if applicable. In addition to regular course work, problem solving skills may be demonstrated by participation in the Mathematical Contest in Modeling. Classroom presentations encourage students to develop skills in communicating mathematical ideas and subtleties to an audience of their peers. Finally, every graduating senior completes a capstone project in which the student’s development in multiple areas is demonstrated.

REQUIREMENTS FOR THE BACHELOR OF ARTS MATHEMATICS
• Complete the EOU BA graduation requirements.
• Completion of a minimum of 60 credit hours in Mathematics and affiliated courses as described below, including a minimum of 36 upper division credit hours in Mathematics.
• Complete each of the following mathematics core courses with a "C-" or better:

LOWER DIVISION CORE:
CS 161 Foundations of CS I (4)
MATH 251 Calculus I (4)
MATH 252 Calculus II (4)
MATH 253 Calculus III (4)
MATH 254 Calculus IV (4)
STAT 243 Elementary Statistics (4)

UPPER DIVISION CORE:
MATH 311 Advanced Calculus (4)
MATH 341 Linear Algebra (4)
MATH 344 Modern Algebra I (4)
MATH 382 Structure of Abstract Math (4)
Either:
MATH 412 Real Analysis (4) or
MATH 445 Modern Algebra II (4)
MATH 407 Capstone Seminar (4)

UPPER DIVISION ELECTIVES:
• 20 credit hours of upper division mathematics courses.
• [For this purpose STAT 352 is considered a mathematics course.]

Proposed Program Total: 72 credits

MATH DEGREE
• Math electives must total at least 20 upper division mathematics credits (for the B.S. degree) or at least 12 upper division mathematics credits (for the B.A. degree). STAT 352 counts as a mathematics course for this purpose. (Additional advising information continues below)

• Students intending to continue into EOU’s MAT program and/or pursue a career as a high school mathematics teacher are advised to include the following among their electives: MATH 323 (Mathematical Modeling), MATH 338 (Modern Geometry), MATH 355 (Advanced Discrete Mathematics), and MATH 361 (Probability and Statistics).

• Students interested in graduate studies in mathematics are advised to include the following among their electives: MATH 321 (Differential Equations), MATH 338 (Modern Geometry), and MATH 355 (Advanced Discrete Mathematics). In addition, such students should include both MATH 412 (Real Analysis) and MATH 445 (Modern Algebra II) within their 400-level courses.

• Students interested in a quantitative career in industry (such as an actuary, statistician, or data analyst) are advised to include the following among their electives: MATH 323 (Math Modeling), MATH 361 (Probability and Statistics), MATH 462 (Applied Regression Analysis), MATH 452 (Operations Research), and STAT 352 (Statistics).
### TYPICAL FIRST YEAR CURRICULUM

**MATHEMATICS** (beginning with MATH 095)

#### Fall
- **MATH 095** Intermediate Algebra (4)
- General Education/Electives (8-11)

#### Winter
- **MATH 111** College Algebra (4)
- General Education/Electives (8-11)

#### Spring
- **MATH 112** Precalculus (4)
- General Education/Electives (8-11)

### TYPICAL SECOND YEAR CURRICULUM

#### Fall
- **MATH 251** Calculus I (4)
- CS 161 Foundations of CS I (4)
- General Education/Electives (7-10)

#### Winter
- **MATH 252** Calculus II (4)
- General Education/Electives (7-10)

#### Spring
- **MATH 253** Calculus III (4)
- **STAT 243** Elementary Statistics (4)
- General Education/Electives (7-10)

### TYPICAL THIRD YEAR CURRICULUM

#### Fall
- **MATH 341** Linear Algebra (4)
- MATH Elective (upper division)* (4)
- General Education/Electives (6-10)

#### Winter
- **MATH 254** Calculus IV (4)
- MATH Elective (upper division)* (4)
- General Education/Electives (6-10)

#### Spring
- **MATH 382** Structures of Abstract Math (4)
- MATH Elective (upper division)* (4)
- General Education/Electives (6-10)

### TYPICAL FOURTH YEAR CURRICULUM

#### Fall
- **MATH 311** Advanced Calculus (4) or
- **MATH 344** Modern Algebra I (4)
- **MATH 407** Capstone Seminar (1)
- MATH Elective (upper division)* (4)
- General Education/Electives (5-9)

#### Winter
- **MATH 412** Real Analysis (4) or
- **MATH 445** Modern Algebra (4)
- MATH Elective (upper division)* (4)
- **MATH 407** Capstone Seminar (1)
- General Education/Electives (5-9)

#### Spring
- **MATH 344** Modern Algebra I (4) or
- **MATH 311** Advanced Calculus (4)
- **MATH 407** Capstone Seminar (2)
- MATH Elective (upper division)* (4)
- General Education/Electives (4-8)
TYPICAL FIRST YEAR CURRICULUM
MATHEMATICS (beginning with Calculus)

TYPICAL FIRST YEAR CURRICULUM
Fall
MATH 251 Calculus I (4)
CS 161 Foundations of CS I (4)
General Education/Electives (4-7)

Winter
MATH 252 Calculus II (4)
CS 162 Foundations of CS II (4) *(BS degree only)
General Education/Electives (4-7)

Spring
MATH 253 Calculus III (4)
STAT 243 Elementary Statistics (4)
General Education/Electiv3s (4-7)

TYPICAL SECOND YEAR CURRICULUM
Fall
MATH 341 Linear Algebra (4)
MATH Elective (upper division)* (4)
General Education/Electives (7-10)

Winter
MATH 254 Calculus IV (4)
MATH Elective (upper division)* (4)
General Education/Electives (7-10)

Spring
MATH 382 Structures of Abstract Math (4)
MATH Elective (upper division)* (4)
General Education/Electives (7-10)

TYPICAL THIRD YEAR CURRICULUM
Fall
MATH 311 Advanced Calculus (4) or
MATH 344 Modern Algebra I (4)
MATH Elective (upper division)* (4)
General Education/Electives (6-10)

Winter
MATH 412 Real Analysis (4) or
MATH 445 Modern Algebra II (4)
MATH Elective (upper division)* (4)
General Education/Electives (6-10)

Spring
MATH Elective (upper division)* (4)
General Education/Electives (10-14)

TYPICAL FOURTH YEAR CURRICULUM
Fall
MATH 311 Advanced Calculus (4) or
MATH 344 Modern Algebra I (4)
MATH 407 Capstone Seminar (1)
MATH Elective (upper division)* (4)
General Education/Electives (5-9)

Winter
MATH 412 Real Analysis (4) or
MATH 445 Modern Algebra I (4)
MATH Elective (upper division)* (4)
MATH 407 Capstone Seminar (1)
General Education/Electives (5-9)

Spring
MATH 407 Capstone Seminar (2)
MATH Elective (upper division)* (4)
General Education/Electives (8-12)

REQUIREMENTS FOR THE MINOR IN MATHEMATICS
• Completion of a minimum of 32 credits in mathematics.
• Complete the calculus sequence (MATH 251, 252, 253), Linear Algebra (MATH 341), and Structure of Abstract Math (MATH 382).
• Complete an additional 12 hours of mathematics courses number 231, 254 or upper division.
• Earn a grade of “C-” or better in MATH 251, 252, 253 and a minimum GPA of 2.00 in all other courses counting toward the minor.
• A minimum of 10 credits applied toward the minor must be completed at Eastern.

REQUIREMENTS FOR THE MINOR IN MATHEMATICAL STUDIES (multidisciplinary studies majors only)
• Complete the following courses:
  MATH 211 Foundations of Elementary Mathematics I (4)
  MATH 251 Calculus I (4)
  MATH 252 Calculus II (4)
  STAT 243 Elementary Statistics (4)
 Either:
    MATH 338 Modern Geometry (4) or
    MATH 382 Structures of Abstract Mathematics
  CS 161 Foundations of CS I (4)
  MTHE 333 Mathematics in Elem School (5)
 One mathematics course numbered 231, 254, or upper-division (4) Total (minimum) 33 CREDITS
• Complete each of the courses counting toward the minor with a grade of “C-” or better and an overall GPA of 2.00.
• A minimum of 10 credits applied toward the minor must be completed at EOU.

REQUIREMENTS FOR THE MINOR IN STATISTICAL MATHEMATICS
• Complete the following courses:
  MATH 251 Calculus I (4)
  MATH 252 Calculus II (4)
  MATH 341 Linear Algebra (4)
  STAT 243 Elementary Statistics (4) or
  STAT 327 Stat & Exper Design (4)
  STAT 352 Statistics (4)
  MATH 361 Probability & Statistics (4)
  MATH 462 Applied Regression Analysis (4)
 One additional upper division course of at least two credits approved by the student’s adviser, this course should ideally be a course in the student’s major in which statistics is used. Total (minimum) 30-31 credits.
• Complete each of the courses counting toward the minor with a grade of “C-” or better with an overall GPA of 2.00.
• A minimum of 10 credits applied toward the minor must be completed at EOU.
MATHEMATICS COURSE DESCRIPTIONS

MATH 040 - Arithmetic Skill (Credits: 1 to 3)
Designed for students who need review in basic computational skills. The course will deal with whole numbers, fractions, decimals, percentages, ratios, and introductory geometry. The class will require independent student effort, and students will have to motivate themselves to attend help sessions when needed. (Not applicable toward baccalaureate degree.)
Prerequisite: MATH 040 or equivalent.

MATH 070 - Elem Algebra (Credits: 4)
Fundamental concepts of algebra. This course is equivalent to first year high school algebra. Concepts include solving equations, graphing equations and inequalities, and solving systems of equations. (Not applicable toward baccalaureate degree.)
Prerequisite: MATH 040 or equivalent.

MATH 095 - Algebraic Foundations (Credits: 4)
This course examines fundamental concepts of algebra and is equivalent to second year high school algebra. Concepts include polynomial expressions and factoring, rational expressions, radical expressions, and quadratic expressions. (Not applicable toward a baccalaureate degree.)
Prerequisite: MATH 070 or equivalent.

MATH 105 - Lotteries & Loans*SMI (Credits: 4)
Gen Ed Core-Natural, Math & Info Sciences
This course is an introduction to certain areas of mathematics whose applications are important and whose study will help develop critical thinking skills. Two major topics are covered. One topic is the mathematics of finance, or "loans," which includes borrowing, saving, mortgages, leases and amortization and derivative securities. The other topic is "lotteries," which includes the elementary counting techniques including permutations and combinations, finite sample space probability theory, normal distributions and the Central Limit Theorem, and games of chance. Prerequisite: MATH 095 or equivalent.

MATH 110 - MATH 110 (Credits: 1 to 6)
Topics of current interest to students and faculty.

MATH 111 - College Algebra (Credits: 4)
Topics examined in this course include equations and inequalities in one variable, a careful treatment of the function concept, and an examination of the properties and applications of several important families of functions: polynomial, rational, exponential and logarithmic. Prerequisite: MATH 095 or equivalent.

MATH 112 - Precalculus (Credits: 4)
In this course students experience a detailed treatment of exponential, logarithmic, trigonometric and inverse trigonometric functions designed to prepare them for calculus. Prerequisite: MATH 111 or equivalent.

MATH 112a - Precalculus Part I (Credits: 2)
This course is the first of a two-part course sequence to be offered. The two course sequence will be equivalent in credit and content to MATH 112 Precalculus. In this course, students experience a detailed treatment of exponential, logarithmic, trigonometric, and inverse trigonometric functions designed to prepare them for calculus. Prerequisite: MATH 112a or equivalent.

MATH 112b - Precalculus Part II (Credits: 2)
This course is the second of a two-part course sequence to be offered. The two course sequence will be equivalent in credit and content to MATH 112 Precalculus. In this course, students experience a detailed treatment of exponential, logarithmic, trigonometric, and inverse trigonometric functions designed to prepare them for calculus. Prerequisite: MATH 112a or equivalent.

MATH 205 - Finite and Linear Mathematics*SMI (Credits: 4)
Gen Ed Core-Natural, Math & Info Sciences
This course surveys an array of non-calculus mathematical topics with contemporary applications to many fields, including business, natural sciences, and economics. Topics include elementary combinatorics and probability, vector and matrix arithmetic, exponential functions, and linear programming. Prerequisites: MATH 95 or placement in MATH 111.

MATH 209 - Field Placement (Credits: 1 to 15)
A planned and supervised work experience involving mathematics at an introductory level, this course offers students an opportunity to examine career goals through a work experience with approved learning objectives.

MATH 210 - Selected Topics (Credits: 1 to 6)
Topics of current interest to students and faculty.

MATH 211 - Found Elem Math I*SMI (Credits: 4)
Gen Ed Core-Natural, Math & Info Sciences
Introduction to basic concepts of elementary mathematics designed to initiate the building of an understanding and appreciation of the nature, structure, philosophy, and history of mathematics. Prerequisite: MATH 095.

MATH 212 - Found Elem Math II*SMI (Credits: 4)
Gen Ed Core - Natural, Math & Info Sciences
Introduction to basic concepts of elementary mathematics designed to initiate the building of an understanding and appreciation of the nature, structure, philosophy, and history of mathematics. Prerequisite: MATH 095.

MATH 213 - Found Elem Mth III*SMI (Credits: 4)
Gen Ed Core-Natural, Math & Info Sciences
Introduction to basic concepts of elementary mathematics designed to initiate the building of an understanding and appreciation of the nature, structure, philosophy, and history of mathematics. Prerequisite: MATH 095.

MATH 231 - Discrete Mathematics (Credits: 4)
This course provides an introduction to several topics from Discrete Mathematics, including mathematical induction, Boolean logic and set operations, counting...
theory (combinatorics), and graph theory. Prerequisite: MATH 111 or equivalent.

MATH 239 - Calculus I*SMI (Credits: 4)
Gen Ed Core-Natural, Math & Info Sciences
This course is the first of a two part course sequence to be offered. Topics cover an introductory look at the calculus of a small family of functions, primarily those encountered in high school algebra. Both differentiation and integration will be discussed together with applications of each. Prerequisite: MATH 111 or equivalent.

MATH 240 - Calculus II*SMI (Credits: 4)
Gen Ed Core-Natural, Math & Info Sciences
This course is the second of a two part course sequence to be offered. Topics cover an introductory look at the calculus of a small family of functions, primarily those encountered in high school algebra. Both differentiation and integration will be discussed together with applications of each. Prerequisite: MATH 239 or equivalent.

MATH 241 - Calculus III*SMI (Credits: 4)
Gen Ed Core-Natural, Math & Info Sciences
This course is the third of a two part course sequence to be offered. Topics cover an introductory look at the calculus of a small family of functions, primarily those encountered in high school algebra. Both differentiation and integration will be discussed together with applications of each. Prerequisite: MATH 240 or equivalent.

MATH 242 - Calculus IV*SMI (Credits: 4)
Gen Ed Core-Natural, Math & Info Sciences
This course is the fourth of a two part course sequence to be offered. Topics cover an introductory look at the calculus of a small family of functions, primarily those encountered in high school algebra. Both differentiation and integration will be discussed together with applications of each. Prerequisite: MATH 241 or equivalent.

MATH 250 - Differential Equations (Credits: 4)
Gen Ed Core-Natural, Math & Info Sciences
This course is the fifth of a two part course sequence to be offered. Topics cover an introductory look at the calculus of a small family of functions, primarily those encountered in high school algebra. Both differentiation and integration will be discussed together with applications of each. Prerequisite: MATH 251 or equivalent.

MATH 251 - Calculus I*SMI (Credits: 4)
Gen Ed Core-Natural, Math & Info Sciences
This course is the first of a two part course sequence to be offered. Topics cover an introductory look at the calculus of a small family of functions, primarily those encountered in high school algebra. Both differentiation and integration will be discussed together with applications of each. Prerequisite: MATH 111 or equivalent.

MATH 252 - Calculus II*SMI (Credits: 4)
Gen Ed Core-Natural, Math & Info Sciences
This course is the second of a two part course sequence to be offered. Topics cover an introductory look at the calculus of a small family of functions, primarily those encountered in high school algebra. Both differentiation and integration will be discussed together with applications of each. Prerequisite: MATH 111 or equivalent.

MATH 253 - Calculus III*SMI (Credits: 4)
Gen Ed Core-Natural, Math & Info Sciences
This course is the third of a two part course sequence to be offered. Topics cover an introductory look at the calculus of a small family of functions, primarily those encountered in high school algebra. Both differentiation and integration will be discussed together with applications of each. Prerequisite: MATH 111 or equivalent.

MATH 254 - Calculus IV*SMI (Credits: 4)
Gen Ed Core-Natural, Math & Info Sciences
This course is the fourth of a two part course sequence to be offered. Topics cover an introductory look at the calculus of a small family of functions, primarily those encountered in high school algebra. Both differentiation and integration will be discussed together with applications of each. Prerequisite: MATH 111 or equivalent.

MATH 300 - Advanced Calculus (Credits: 4)
Gen Ed Core-Natural, Math & Info Sciences
This course is the fifth of a two part course sequence to be offered. Topics cover an introductory look at the calculus of a small family of functions, primarily those encountered in high school algebra. Both differentiation and integration will be discussed together with applications of each. Prerequisite: MATH 253 or equivalent.

MATH 301 - Modern Algebra I (Credits: 4)
Gen Ed Core-Natural, Math & Info Sciences
This course is the first of a two part course sequence to be offered. Topics cover an introductory look at the calculus of a small family of functions, primarily those encountered in high school algebra. Both differentiation and integration will be discussed together with applications of each. Prerequisite: MATH 111 or equivalent.
MATH 355 - Adv Top Discrete Math (Credits: 4)
This course examines topics in discrete mathematics at an advanced level. Topics include set theory, relations, graph theory, analysis of algorithms, and enumeration. Prerequisite: MATH 252 or consent of instructor. Student must have at least sophomore standing to register for this course.

MATH 361 - Probability & Statistics (Credits: 4)
In this course, students examine the foundation of elementary probability theory and statistics in both the discrete and continuous cases. Topics include probability density functions, moments and moment generating functions, random variables, samples and sampling distributions, estimation of parameters, and applications. Prerequisite: MATH 252 and STAT 243. Student must have at least sophomore standing to register for this course.

MATH 382 - Structures Abstract Math (Credits: 4)
Institutional Graduation Requirement - UWR
This course provides an introduction to many topics used frequently in advanced courses, as well as a thorough introduction to proof techniques. The context includes elementary logic, naive set theory, number theory, and topology. Prerequisite: MATH 341 or consent of instructor. Student must have at least sophomore standing to register for this course.

MATH 401 - Research (arranged) (Credits: 1 to 4)
Individual research project selected with and supervised by a member of the mathematics faculty. Prerequisite: Consent of instructor.

MATH 405 - Reading and Conf. (arranged) (Credits: 1 to 15)
Student must have at least junior standing to register for this course.

MATH 407 - Seminar/Capstone (Credits: 1 to 15)
Institutional Graduation Requirement - UWR
Student must have at least junior standing to register for this course.

MATH 409 - Field Placement (Credits: 1 to 15)
A planned and supervised work experience involving mathematics at an advanced level, this course offers students an opportunity to examine career goals through a work experience with approved learning objectives. Student must have at least junior standing to register for this course.

MATH 410 - Selected Topics (Credits: 1 to 6)
Student must have at least junior standing to register for this course.

MATH 412 - Real Analysis (Credits: 4)
A second term of advanced calculus covering the theory of derivatives and the Riemann integral. Prerequisite: MATH 311. Student must have at least junior standing to register for this course.

MATH 445 - Modern Algebra II (Credits: 4)
Continues the studies begun in MATH 344, extended by an introduction to rings and fields. Prerequisite: MATH 344. Student must have at least junior standing to register for this course.

MATH 452 - Operations Research (Credits: 4)
In this course, students examine linear optimization methods in mathematics. Topics include linear programming models, solution techniques, and sensitivity analysis. Prerequisite: MATH 252 and 341. Student must have at least junior standing to register for this course.

MATH 462 - Applied Regression Analysis (Credits: 4)
An introduction to statistical methods in regression and analysis of variance through the unifying theme of the general linear model. Prerequisite: STAT 243 and MATH 341 required; STAT 352 recommended. Student must have at least junior standing to register for this course.

MATH 483 - PDEs & Engineering Math (Credits: 4)
A course covering advanced multi-variable and complex calculus together with partial differential equations. Topics include Fourier series, the heat and wave equations, analytic mappings of the complex plane, and other advanced mathematics commonly used in the fields of physics and engineering. Prerequisite: MATH 321 required and MATH 254 recommended. Student must have at least junior standing to register for this course.

MATH 505 - Reading and Conf (arranged) (Credits: 1 to 15)
Student must have graduate standing to register for this course.