AIMS OF THE PROGRAM

First, we aim to give each student an understanding of basic mathematics and its application to solving problems expressible by algebraic equations and inequalities. Second, we aim to train students to understand the fundamental concepts of mathematics so that they can teach the subject on the elementary or secondary level. Third, we aim to give a solid foundation in the area of mathematics which will prepare students to pursue further studies in mathematics, the physical sciences, economics, and the engineering sciences.

PROGRAMS

B.A. Mathematics - 33 hours (21 u.d.)
B.S. Mathematics - 36 hours (24 u.d.)
B.S. Mathematical Physics - 52 hours (30 u.d.)
Minor in Mathematics - 18 hours (6 u.d.)
B.S. Mathematics - Secondary Certification - 36 hours (21 u.d.)
Minor in Mathematics - Secondary Certification - 26 hours (12 u.d.)

Mathematics, B.A.
MATH 181 Calculus I ......................................................... 4
MATH 282 Calculus II ......................................................... 4
MATH 283 Calculus III ......................................................... 4
MATH 321 Differential Equations .......................................... 3
MATH 341 Geometry .......................................................... 3
MATH 361 Introduction to Linear Algebra ............................. 3
MATH 471 Advanced Calculus .............................................. 3
MATH Electives (upper division) ........................................... 6
TOTAL (21 upper division) .................................................... 36

Required cognates: MATH 201

Mathematics, B.S.
MATH 181 Calculus I ......................................................... 4
MATH 282 Calculus II ......................................................... 4
MATH 283 Calculus III ......................................................... 4
MATH 321 Differential Equations .......................................... 3
MATH 341 Geometry .......................................................... 3
MATH 361 Introduction to Linear Algebra ............................. 3
MATH 431 Modern Algebra ................................................... 3
MATH Electives (upper division) ........................................... 3
TOTAL (24 upper division) .................................................... 36

Required cognates: MATH 201, CSIS 110 or equivalent.

Mathematics Minor - Secondary Teaching Area
Option I
MATH 121 Precalculus ....................................................... 3
MATH 181 Calculus I ......................................................... 4
MATH 241 Introduction to Probability and Statistics ............... 3
MATH 282 Calculus II ......................................................... 4
MATH 341 Geometry .......................................................... 3
MATH 361 Introduction to Linear Algebra ............................. 3
MATH Electives (upper division) ........................................... 6
TOTAL (12 upper division) .................................................... 26

Mathematical Physics, B.S.
MATH 181 Calculus I ......................................................... 4
MATH 282 Calculus II ......................................................... 4
MATH 283 Calculus III ......................................................... 4
MATH 321 Differential Equations .......................................... 3
MATH 361 Introduction to Linear Algebra ............................. 3
MATH 381 Complex Variables ............................................. 3
MATH 411 Numerical Analysis ............................................ 3
MATH 431 Modern Algebra ................................................... 3
MATH 471 Advanced Calculus .............................................. 3
MATH 455 Probability Theory ............................................. 3
PHYS 121 General Physics I ................................................. 1
PHYS 221 General Physics with Calculus I ........................... 1
PHYS 222 General Physics with Calculus II ........................... 1
PHYS 311 Modern Physics ................................................... 3
PHYS 322 Classical Mechanics ........................................... 3
PHYS 351 Electromagnetic Fields ........................................ 3
PHYS 411 Quantum Mechanics .......................................... 3
TOTAL (30 upper division) .................................................... 52

Required cognates: MATH 201 or CHEM 201; CHEM 111,112; and CSIS 110; or equivalent.
The B.S. in Mathematical Physics is a composite major, therefore no minor is required.

TEACHING CERTIFICATION PROGRAM

The following mathematics major and minor are for teaching certification only. Requirements for certification are listed in the Education section of this bulletin.

You must make formal application for admittance to the Teacher Education Program. Applications are available at the Education Department office.
MATHEMATICS FOUNDATION COURSES

It is recognized that attempting a mathematics course for which a student is not prepared can be challenging and frustrating. In order that the mathematics experience be as smooth and gentle as possible, the department offers two review courses, MATH 011 and MATH 012 to provide a foundation for college-level mathematics courses. These are available for any student who needs to take advantage of the additional time and exposure and build a solid basis in algebra. Students whose previous mathematics courses or M.A.P. recommends they register for MATH 110 or a higher-level mathematics course are not permitted to register for either MATH 011 or MATH 012 except by the permission of the department.

COURSES

MATH 011 Introduction to Algebra 3 hours
This course begins the review of the arithmetic and algebra of the real numbers. Topics include problem solving, sets, arithmetic operations on integers, rational numbers, and real numbers, variable expressions, rectangular coordinate system and graphs, relations and functions, properties of functions, solution techniques and applications of first-degree equations, absolute value, linear functions, introduction to linear regression, systems of linear equations, applications and solution methods for simultaneous linear equations.

This course is available only for those students who have a need to review elementary algebra. It schedules extra help and instruction and progresses through the material in a paced manner. Students whose M.A.P. recommends that they register for Intermediate Algebra, MATH 012, or a higher level mathematics course are not allowed to register for MATH 011 except by permission of the department. The course meets five days a week. A student may withdraw from this course only in the event he or she withdraws from all courses. This course does not apply toward general education or graduation requirements. (Fall, Spring)

MATH 012 Intermediate Algebra 3 hours
Prerequisite: MATH 011 with a grade of at least a C, or high school Algebra I with a grade of at least a C and acceptable M.A.P. recommendation, or permission of the department.

A continuation of the review of algebra begun in MATH 011. Topics include rational expressions and rational equations, proportions, radical expressions and rational exponents, the Pythagorean theorem, operations on radical expressions, radical functions, introduction to complex numbers, quadratic equations, solution methods for quadratic equations, and properties of quadratic functions.

This review course is available only for those students who have a need to prepare for a further mathematics course. It schedules extra help and instruction and progresses through the material in a paced manner. Students whose M.A.P. recommends that they register for College Algebra, MATH 110, or a higher level mathematics course are not allowed to register for MATH 012 except by permission of the department. This course meets five days a week. A student may withdraw from this course only in the event he or she withdraws from all courses. This course does not apply toward general education or graduation requirements. (Fall, Spring)

MATH 110 College Algebra 3 hours
Prerequisite: MATH 012 with a grade of at least a C, or high school Algebra II with a grade of at least a C and acceptable M.A.P. recommendation, or permission of the department.

A study of algebraic expressions, equations, inequalities, and functions. Includes function composition, inverse functions, and graphs of functions. Solutions of linear and quadratic functions are presented (including complex numbers) with extension to other polynomial functions. Topics also include properties and graphs of rational functions, exponential and logarithmic functions and applications, and systems of linear equations and their solutions including matrix methods and determinants. (Fall, Spring)

MATH 121 Precalculus 3 hours
Prerequisite: High school algebra II with a grade of at least a B and acceptable M.A.P. recommendation, or MATH 110, or permission of the department.

A review of basic properties of functions including their domain, range, graphs, and relationship to their inverse functions. An introduction to trigonometry including basic definitions of the trigonometric functions and their properties, identities, and specific trigonometric formulae such as addition and subtraction, double-angle, and half-angle. Applications to triangles are covered utilizing the laws of sines and cosines. Other topics such as polar coordinates and conic sections are presented. This course includes an introduction to sequences, series, limits, and aspects of calculus. (Fall, Spring)

MATH 181 Calculus I 4 hours
Prerequisite: MATH 121 with a grade of C or higher, or a high school precalculus course and permission of the instructor.

A study of algebraic and transcendental functions of one variable, limits, continuity, differentiation, integration, and applications of derivatives and integrals. (Spring)

MATH 201 Research Methods in Mathematics 1 hour
Prerequisite: ENGL 121, MATH 181

An introduction to the library research skills used in mathematics. The use of primary and secondary sources will be discussed as well as publication styles. Students will be exposed to mathematical software used in mathematics research, and will engage in activities to sharpen critical thinking. In this course, majors in mathematics begin the process of senior portfolio development. This course fulfills the requirement for UNIV 201; Research in an Academic Discipline, as specified in SWAU’s Quality Enhancement Plan. (Spring)

MATH 241 Introduction to Probability and Statistics 3 hours
Prerequisite: High school Algebra II with a grade of at least a B and acceptable M.A.P. recommendation, or MATH 110, or permission of the department.

An introduction to the statistical processes of sampling, descriptive statistics, presentation of data, and inferential statistics. Included are elements of probability, discrete and continuous random variables, and the probability basis for hypothesis testing. Specific statistical techniques and concepts include use of the normal distribution, the t-distribution, X² distribution, analysis of variance, correlation, and linear regression. (Fall, Spring)
MATH 282 Calculus II 4 hours
Prerequisite: MATH 181 with a grade of C or higher.
A study of the calculus of transcendental functions, introduction to differential equations, applications of integration, techniques of integration, and infinite series. (Fall)

MATH 283 Calculus III 4 hours
Prerequisite: MATH 282 with a grade of C or higher.
A study of vectors in two and three dimensions, motion in space, polar, cylindrical and spherical coordinate systems, functions of several variables, partial derivatives, multiple integrals, and differentiation and integration in scalar and vector fields. (Spring)

MATH 291 Selected Topics 1 hour
Prerequisite: Approval by the department chair.
Designed for the student who wishes to do independent study or research. Content and method of study must be arranged prior to registration. May be repeated for a total of 2 credits.

MATH 321 Differential Equations 3 hours
Prerequisite: MATH 283.
This is a study of ordinary differential equations with emphasis on the analytic methods for solving them. (Fall, even years)

MATH 341 Geometry 3 hours
Prerequisite: MATH 282.
This course is a study of Euclidean and non-Euclidean geometry. (Spring, even years)

MATH 361 Introduction to Linear Algebra 3 hours
Prerequisite or corequisite: MATH 283.
An introduction to vector spaces and matrix theory over the field of real numbers. (Spring, odd years)

MATH 381 Complex Variables 3 hours
Prerequisite: MATH 283.
This course is a study of analytic functions, power series, calculus of residues, and conformal mappings. (Spring, odd years)

MATH 411 Numerical Analysis with Application 3 hours
Prerequisite: MATH 283 and knowledge of a computer programming language.
This is a course in numerical methods for solving mathematical problems. The writing of computer programs for solving problems is a part of the course. (Spring, even years)

MATH 431 Modern Algebra 3 hours
Prerequisite: MATH 361.
A study of the abstract systems: groups, rings, fields, and integral domains. (Fall, odd years)

MATH 455 Probability Theory 3 hours
Prerequisite: MATH 282.
A study of the basic ideas of probability theory, discrete and continuous random variables, and their distributions. This class fulfills the requirement for an upper-division class with QEP components as specified in SWAU's Quality Enhancement Plan. (Fall, odd years)