MATHEMATICS, SECONDARY CERTIFICATION OPTION

Bachelor of Science

The B.S. Mathematics with Secondary Certification program emphasizes a blend of mathematical studies and practical experiences in schools. The curriculum includes integrated components emphasizing in-depth math content knowledge, learning theory, and methodology practices in math. Prospective mathematics teachers develop sufficient content knowledge as well as the fundamental teaching skills necessary to teach all middle school and high school level courses in the mathematical sciences. Students in this program will take math courses in proof writing, geometry, abstract algebra, real analysis, and probability and statistics as well as education courses in teaching diverse learners, classroom management, curriculum and assessment, and teaching methods and strategies.

Area A: Essential Skills
Grades of C or better required.

ENGL 1101 English Composition I 3
ENGL 1102 English Composition II 3
MATH 1113 Precalculus Mathematics 3

Area B: Institutional Options

COMM 1110 Fundamentals of Speech 3

One of the following electives: 1

COMM 1120 Argumentation and Advocacy
ENGL 1105 Intro to Greek Mythology
ENGL 1110 Creative Writing
GEOL 1000 Natural Hazards
HIST 1050 Appalachian Hist-Special Topic
HIST 1051 Sports Hist & Amer Character
HLTH 1030 Health and Wellness Concepts
HUMN 1000 Mystery Fiction in Pop Culture
HUMN 1100 Political and Social Rhetoric
HUMN 1300 Christian Fiction/Pop Culture
SOCI 1000 Race and Ethnicity in America
PRSP Elective (See advisor)

Area C: Humanities/Fine Arts

Choose one or two ENGL course(s): 3-6

ENGL 2111 World Literature I
ENGL 2112 World Literature II
ENGL 2120 British Literature I
ENGL 2121 British Literature II
ENGL 2130 American Literature I
ENGL 2131 American Literature II
ENGL 2201 Intro to Film as Literature

If only one ENGL course chosen add one of the following: 0-3

ARTS 1100 Art Appreciation
HUMN 1201 Expressions of Culture I
HUMN 1202 Expressions of Culture II
MUSC 1100 Music Appreciation
MUSC 1110 World Music
MUSC 1120 American Music

Area D: Science/Mathematics/Technology

One of the following Laboratory Science Sequences: 8

BIOL 1107K & BIOL 1108K Principles of Biology I and II
CHEM 1211K & CHEM 1212K Principles of Chemistry I and II
PHYS 1111K & PHYS 1112K Introductory Physics I and II
PHYS 2211K & PHYS 2212K Principles of Physics I and II
MATH 2253 Calculus and Analytic Geom I * 4

Area E: Social Sciences

HIST 2111 United States History to 1877 3
or HIST 2112 United States History since 1877 3
POLS 1101 American Government 3

Two of the following electives: 6

ANTH 1103 Intro to Cultural Anthropology
ECON 2105 Principles of Macroeconomics
ECON 2106 Principles of Microeconomics
GEOG 1100 Introduction to Geography
GEOG 1101 Intro to Human Geography
GEOG 1111 Intro to Physical Geography
HIST 1111 World Civilization to 1500 CE
HIST 1112 World Civilization since 1500
HIST 2111 United States History to 1877
HIST 2112 United States History since 1877
PHIL 1103 Intro to World Religions
PHIL 2010 Intro to Philosophical Issues
PHIL 2020 Logic and Critical Thinking
POLS 2101 Intro to Political Science
POLS 2201 State and Local Government
POLS 2301 Comparative Politics
POLS 2401 International Relations
PSYC 1101 Introduction to Psychology
PSYC 2101 Psychology of Adjustment
PSYC 2103 Human Development
SOCI 1101 Introduction to Sociology
SOCI 1160 Social Problems

Area F: Major Related

Grades of C or better required.

CMPS 1301 Principles of Programming I 3
MATH 2254 Calculus and Analytic Geom II 4
MATH 2255 Calculus and Analytic Geom III 4
MATH 2256 Introduction to Linear Algebra 3
MATH 2403 Differential Equations 4

Upper Level Required Courses

MATH 3101 Intro to Advanced Mathematics 3
MATH 3201 Geometry 3
MATH 4001 History of Mathematics 3
MATH 4101 Abstract Algebra I 3
MATH 4201 Number Theory 3
MATH 4301 Graph Theory 3
## Mathematics, Secondary Certification Option

**Upper Level Math Electives**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 4601</td>
<td>Real Analysis I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 4701</td>
<td>Probability and Statistics I</td>
<td>3</td>
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</tbody>
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Choose one of the following: 3 units

- MATH 4102 Abstract Algebra II
- MATH 4602 Real Analysis II
- MATH 4702 Probability and Statistics II

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### Education Courses

**Prior to enrollment in EDUC 2110, EDUC 2120, and EDUC 2130, students must have taken PSYC 1101, COMM 1110, and Area A courses with grades of C or better. Approved Background check, proof of professional Liability Insurance, completion of the mandated reporter training course, and a passing score on an Ethics assessment are also required. EDUC 2110, EDUC 2120, EDUC 2130 must be completed with grades of C or better prior to acceptance into PES I.**

**EDUC 2110 Investig Critical/Contem Issue (Includes 10 hrs of practicum)**

**EDUC 2120 Expl Socio-Cultural Perspect (Includes 10 hrs of practicum)**

**EDUC 2130 Exploring Learning/Teaching (Includes 10 hrs of practicum)**

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### Professional Education Semester 1 (Block I) - Fall Semester

Prior to enrollment in PES I courses, students must be accepted to the Teacher Education Program and have completed 8 credit hours of Mathematics with grades of C or better.

**EDUC 3902 Curric/Asses Secondary Teacher**

**EDUC 3272 Class Mgmt Sec Ed Field Exp I**

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### Professional Education Semester 2 (Block II) - Spring Semester

Prior to enrollment in PES II courses, students must have completed EDUC 3902 and EDUC 3272 with grades of C or better.

**EDUC 3273 Class Mgmt Sec Ed Field Exp II**

**EDUC 4901 Methods/Strat Teach Sec Stu**

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### Professional Education Semester 3 (Block III) - Fall Semester

Prior to enrollment in PES III courses, students must have completed EDUC 3273 and EDUC 4901 with grades of C or better.

**EDUC 3120 Teaching Diverse Learners(Sec)**

**EDUC 3274 Class Mgmt Sec Ed Field Exp III**

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### Professional Education Semester 4 (Block IV) - Spring Semester

Prior to enrollment in PES IV, students must have completed EDUC 3120, EDUC 3274, and 24 credit hours of Mathematics with grades of C or better.

**READ 3456 Reading across Curric Sec Educ**

**EDUC 4951 Internship in Sec School Math**

**EDUC 4953 Teaching Internship Seminar**

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## Physical Education Elective

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHED Activity Elective</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

Total Hours 126
Mathematics, Secondary Certification Option

MATH 1001. Quantitative Skills/Reasoning. 3-0-3 Units.
This course is an alternative in Area A of the Core Curriculum and is not intended to supply sufficient algebraic background for students who intend to take precalculus or the calculus sequence for mathematics and science majors. This course places quantitative skills and reasoning in the context of experiences that students will be likely to encounter. It emphasizes processing information in context from a variety of representations, understanding of both the information and the processing, and understanding which conclusions can be reasonably determined. (F,S)
Prerequisites: Placement into corequisite Learning Support mathematics, unless exempt.

MATH 1101. Intro to Mathematical Modeling. 3-0-3 Units.
This course is not intended to supply sufficient algebraic background for students who intend to take precalculus or the calculus sequence for mathematics and science majors. This course is an introduction to mathematical modeling using graphical, numerical, symbolic, and verbal techniques to describe and explore real-world data and phenomena. Emphasis is on the use of linear, polynomial, exponential, and logarithmic functions to investigate and analyze applied problems and questions, supported by the use of appropriate technology, and on effective communication of quantitative concepts and results. (F,S,M)
Prerequisites: Placement into corequisite Learning Support mathematics, unless exempt.

MATH 1104. Applied Mathematics. 3-0-3 Units.
Topics include arithmetic, elementary algebra, geometry, measurement, and elementary trigonometry. (Career Course) (F,S,M)
Prerequisites: MATH 0090 unless exempt for learning support mathematics.

MATH 1111. College Algebra. 3-0-3 Units.
Presents topics in algebra, including the number system, polynomials, algebraic functions, exponents, radicals, linear and quadratic equations, inequalities, lines in the plane, linear modeling, conics, algebra of functions, exponential and logarithmic functions and systems of equations and inequalities. (F,S,M)
Prerequisites: MATH 0998 and MATH 1101 if not eligible for MATH 0999. Corequisites: MATH 0999 unless exempt from learning support.

MATH 1112. Preparatory College Algebra. 3-0-3 Units.
Provides immediate transition from high school algebra into calculus and physics. Material goes beyond that normally covered in Mathematics 1111. Algebra topics include linear, quadratic equations, functions and graphing, exponential and logarithmic functions. Trigonometry topics include trigonometric functions and inverse, law of sines, law of cosines and identities. For students planning to take calculus and/or physics. (F,S,M)
Prerequisites: MATH 1111.

MATH 1401. Elementary Statistics. 3-0-3 Units.
This is a non-calculus based introduction to statistics. Course content includes descriptive statistics, probability theory, confidence intervals, hypothesis testing, and other selected statistical topics. (F,S,M)
Prerequisites: MATH 1001, MATH 1101, or MATH 1111.

MATH 1501. Calculus I. 4-0-4 Units.
This course includes material on functions, limits, continuity, the derivative, anti-differentiation, the definite integral, and techniques of integration. (F,S,M)
Prerequisites: MATH 1113.

MATH 2008. Found of Numbers & Operations. 3-0-3 Units.
This course will emphasize the understanding and use of the major concepts of number and operations. Topics include problem-solving strategies; inductive and deductive reasoning; numeration systems and place value; operations and algorithms; identity elements and inverse operations; rational and irrational numbers; integers and number theory; special sets of numbers; exponents and decimals; ratios, percent’s, and proportional reasoning. (F,S)
Prerequisites: MATH 1101, MATH 1111, or MATH 1113.

MATH 2181. Applied Calculus. 3-0-3 Units.
Surveys differential and integral calculus of polynomial, rational, exponential and logarithmic functions. Detailed applications to problems and concepts from business, economics and life science are covered. (F,S,M)
Prerequisites: MATH 1111, MATH 1101, or MATH 1113 with a grade of C or better.

MATH 2200. Introduction to Statistics. 3-0-3 Units.
Surveys descriptive and inferential statistics. Topics include organizing and graphing data, measures of central tendency, dispersion, probability, normal distribution, sampling, confidence intervals, hypothesis tests, significance tests, correlation and regression. (F,S,M)
Prerequisites: MATH 1001, MATH 1101, MATH 1111, or MATH 1113.

MATH 2253. Calculus and Analytic Geom I. 4-0-4 Units.
Includes topics limits and continuity, derivatives and their applications and an introduction to the concept of the integral. The first in a four course sequence in Calculus. Prerequisite: MATH 1113 or satisfactory mathematics scores of SAT 600/ACT 26 and one year of high school trigonometry. (F,S,M)
Prerequisites: MATH 1113.

MATH 2254. Calculus and Analytic Geom II. 4-0-4 Units.
Emphasizes the definite integral and its applications, the calculus of trigonometric, exponential, logarithmic, hyperbolic and inverse functions, techniques of integration, improper integrals, L’ Hopital’s Rule, infinite series and conic sections. The second course in the Calculus sequence. (F,S,M)
Prerequisites: MATH 2253.

MATH 2255. Calculus and Analytic Geom III. 4-0-4 Units.
Emphasizes calculus in three dimensions. Topics include vectors, parametric equations, partial derivatives, multiple integrals and their applications and topics in vector calculus. The third course in the Calculus sequence. (F,S,M)
Prerequisites: MATH 2254.

MATH 2256. Introduction to Linear Algebra. 3-0-3 Units.
Introduces low-dimensional linear algebra through eigenvalues and eigenvectors. Applications to linear systems, least-square problems, and the calculus, including elementary differential equations. (F,S,M)
Prerequisites: MATH 2253. Corequisites: MATH 2254.

MATH 2403. Differential Equations. 3-2-4 Units.
A study of differential equations, including first and higher order equations, linear and nonlinear systems of equations, numerical methods to approximate solutions, using Laplace transforms to determine solutions, and methods that yield infinite series solutions. (F,S,M)
Prerequisites: MATH 2254 and MATH 2256.
MATH 2602. Linear & Discrete Mathematics. 3-2-4 Units.
Explains topics in linear algebra, induction, combinatorics, difference equations, and multivariate optimization with an emphasis on discrete and recursive methods.(F,S)
Prerequisites: MATH 2255.

MATH 2770. Statistics and Applications. 3-0-3 Units.
Introduces the student to topics in probability, probability distributions, point estimation, confidence intervals hypothesis testing, linear regression and analysis of variance.(F,S,M)
Prerequisites: MATH 2255.

MATH 3050. Biological Statistics. 3-0-3 Units.
Advanced concepts in statistics are introduced. Topics include experimental design, hypothesis testing, t-test, z-test, chi-squared test, regression, ANOVA, and non-parametric methods. (F) Pre-requisite: MATH 2200.

MATH 3101. Intro to Advanced Mathematics. 3-0-3 Units.
Preparation in mathematical reasoning and proof-writing necessary for upper division course work in mathematics. Topics include logic, integers and induction, sets and relations, equivalence relations and partitions, and functions.(S)
Prerequisites: MATH 2254.

MATH 3201. Geometry. 3-0-3 Units.
An introduction to Euclidean and non-Euclidean geometries developed with the study of constructions, transformations, applications, and the rigorous proving of theorems.(F)
Prerequisites: MATH 3101.

MATH 3301. Combinatorics. 3-0-3 Units.
Basic counting principles: permutations, combinations, probability, occupancy problems, and binomial coefficients. More sophisticated methods include generating functions, recurrence relations, inclusion/exclusion principles, and the pigeonhole principle. Additional topics include asymptotic enumeration, Polya counting theory, combinatorial designs, coding theory, and combinatorial optimization.(Spring Odd Years)
Prerequisites: MATH 2254.

MATH 3401. Linear Algebra. 3-0-3 Units.
Theory and applications of matrix algebra, vector spaces, and linear transformations; topics include characteristic values, the spectral theorem, and orthogonality.(Spring Even Years)
Prerequisites: MATH 2256.

MATH 3703. Geometry for P-8 Teachers. 3-0-3 Units.
Continues MATH 2008, with emphasis for teachers of grades P-8. Logic; real numbers; basic and transformational geometry; measurement, including the metric system; problem solving; methods and materials for teaching mathematics at the P-8 level.(S,M)
Prerequisites: MATH 2008.

MATH 3803. Algebra for P-8 Teachers. 3-0-3 Units.
Provides special emphasis for teachers of grades P-8 on understanding of the fundamental concepts of algebra with particular attention to specific methods and materials of instruction.(F,S)
Prerequisites: MATH 2008.

MATH 3900. Special Topics in Mathematics. 0-0-1-3 Unit.
Variable 1–3 hours. Advanced concepts in mathematics are presented, the content varies with the topic. Course may be repeated for credit when topic differs. Pre-requisite: MATH 2253 Calculus and Analytic Geometry I and Permission of Instructor. (Offered As Needed)

MATH 4001. History of Mathematics. 3-0-3 Units.
Examines major developments, central themes, and important issues in mathematics throughout history. Undertakes an overview of the historical development of the discipline by focusing on specific theories, problems, and results.(F)
Prerequisites: MATH 3101.

MATH 4101. Abstract Algebra I. 3-0-3 Units.
An axiomatic approach to algebraic structures. Topics include groups, permutations, homomorphisms, and factor groups.(F)
Prerequisites: MATH 3101.

MATH 4102. Abstract Algebra II. 3-0-3 Units.
Examines the central concepts of ring theory and field theory. Topics include modules, Galois theory, integral domains, and advanced linear algebra. Strongly recommended for students intending to complete a graduate degree in mathematics.(S)
Prerequisites: MATH 4101.

MATH 4201. Number Theory. 3-0-3 Units.
A study of elementary problems in number theory with topics from divisibility, congruences, residues, special functions, Diophantine equations, and continued fractions.(S)
Prerequisites: MATH 3101.

MATH 4301. Graph Theory. 3-0-3 Units.
Elementary theory of graphs and digraphs. Topics include connectivity, reconstructions, trees, Euler’s problem, hamiltonicity, network flows, planarity, node and edge colorings, tournaments, matchings, and extremal graphs. A number of algorithms and applications are included.(F)
Prerequisites: MATH 3101.

MATH 4401. Operations Research. 3-0-3 Units.
Linear programming, the simplex method, network theory, game theory, Markov analysis, and other topics such as inventory analysis, queuing theory, integer programming.(S)
Prerequisites: MATH 3401.

MATH 4502. Statistics for Process Control. 3-0-3 Units.
Introduces application techniques used in quality/process control with particular application to area industries. Topics include probability, sampling distributions, control charts for variables, attributes, lot-by-lot sampling plans, acceptance sampling for variables, elementary reliability calculations, and an introduction to the concept of quality costs.(Spring Even Years As Needed)
Prerequisites: MATH 2181 or MATH 2253 and MATH 2200 or MATH 4701.

MATH 4511. Numerical Analysis I. 3-0-3 Units.
Numerical solution of equations, polynomial approximation, numerical differentiation and integration, numerical solutions of ordinary differential equations, error analysis. Written programs using algorithms.(F)
Prerequisites: MATH 2403 and CMPS 1301.

MATH 4512. Numerical Analysis II. 3-0-3 Units.
Numerical solution of equations, polynomial approximation, numerical differentiation and integration, numerical solutions of ordinary differential equations, error analysis. Written programs using algorithms.(S)
Prerequisites: MATH 2256 or CMPS 1301.

MATH 4601. Real Analysis I. 3-2-4 Units.
Develops a rigorous approach to functions of a real variable. Topics include limits, continuous functions, differentiation, and Riemann integration.(F)
Prerequisites: MATH 3101.
MATH 4602. Real Analysis II. 3-0-3 Units.
Continuous and rigorous approach to functions with an emphasis on functions in higher dimensions, including derivatives and integrals in n-dimensional Euclidean space. (S)
Prerequisites: MATH 4601.

MATH 4611. Complex Analysis. 3-0-3 Units.
Complex numbers, analytic functions, complex series, Cauchy theory, residue calculus, conformal mapping. (Summer)
Prerequisites: MATH 4601.

MATH 4701. Probability and Statistics I. 3-0-3 Units.
Sampling distributions, Normal, t, chi-square and F distributions. Moment generating function methods, Bayesian estimation and introduction to hypothesis testing. (F)
Prerequisites: MATH 2255.

MATH 4702. Probability and Statistics II. 3-0-3 Units.
Hypothesis testing, likelihood ration tests, nonparametric tests, bivariate and multivariate normal distributions. (S)
Prerequisites: MATH 4701.

MATH 4713. Prob & Stat for P-8 Teachers. 3-0-3 Units.
Provides special emphasis for teachers of grades P-8 on the fundamental concepts of probability and statistics with particular attention to specific methods and materials of instruction. (FS,M)
Prerequisites: MATH 2008.

MATH 4800. Topology. 3-0-3 Units.
This course develops the concepts of open and closed sets, topological spaces, bases, subspaces, continuous functions, homeomorphisms, connected spaces and compact spaces. (F)
Prerequisites: MATH 3101.

MATH 4900. Special Topics in Mathematics. 0-0-1-3 Unit.
Variable 1–3 hours. Advanced concepts in mathematics are presented, the content varies with the topic. The course may be repeated for credit when topic differs. Pre-requisite: MATH 3101 Intro to Advanced Mathematics and 2 additional upper level Mathematics courses excluding MATH 3703, 3803, and 4713. Approval of the Instructor is required before registration. (As Available)

MATH 4960. Research in Mathematics. 0-0-1-3 Unit.
Students will select a research topic, complete a written research proposal, and in association with a faculty mentor, execute the research plan. This course affords interested junior and senior students an opportunity to participate in a basic research experience with a member of the department faculty. The student will prepare both written and oral presentations of the work, and where appropriate, will be encouraged to make presentations at professional meetings or submit work to a journal for publication. (Dept. Chair Approval) (FS,M as available)
Prerequisites: Permission of the faculty mentor.