

MATHEMATICS EDUCATION SPECIALIZATION HANDBOOK



FOR SPECIALIZATIONS LEADING TO
WEST VIRGINIA CERTIFICATION
Teaching Field Grades 5-Adult & Teaching Endorsement Grades 5-9

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The Six Principles for School Mathematics describe the mathematical understanding, knowledge, and skills that students should acquire from Prekindergarten through Grade 12 ([National Council of Teachers of Mathematics \[NCTM\]](#)) and include the following:

- **Equity.** Excellence in mathematics education requires equity—high expectations and strong support for all students.
- **Curriculum.** A curriculum is more than a collection of activities: it must be coherent, focused on important mathematics, and well-articulated across the grades.
- **Teaching.** Effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it well.
- **Learning.** Students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge.
- **Assessment.** Assessment should support the learning of important mathematics and furnish useful information to both teachers and students.
- **Technology.** Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning.

At Shepherd University, the Program Goals for candidates within the Mathematics Program also include the following:

- To develop the mathematics skills needed to teach among the major mathematical domains: Number; Algebra and Functions; Statistics and probability; Geometry, Trigonometry, and Measurement; Calculus; and Discrete Mathematics;
- To develop and train students in mathematical processes of problem solving; reason and communicate mathematically; and engage in mathematical modeling;
- To train students to plan rigorous and engaging mathematics instruction supporting students' equitable access and culturally responsible opportunities for learning;
- To develop and train effective and equitable teaching practices to support rigorous mathematical learning for a full range of cognitive abilities of diverse populations of students;
- To foster research-based assessments and use evidence of students' learning to improve instruction and subsequent student learning;
- To foster networking and professional growth opportunities to support teacher candidate learning, and to create more equitable mathematics learning environments;
- To engage teacher candidates in a planned sequence of field experiences and clinical practice in diverse settings under the supervision of experienced and highly qualified mathematics teachers.

Four-Year Course Progression – Fall 2022 Catalog

FALL				SPRING			
Sub./Course No.	Tier	First Year Title	Credit	Sub./Course No.	Tier	First Year Title	Credit
Core Curriculum	1	ENGL 101	3	Core Curriculum	1	ENGL 102	3
Core Curriculum	1	Choose History (100-level)	3	EDUC 150	1	Seminar in Education (FYEX)	1
COMM 202	2	Fundamentals of Speech (HM-GL) (Req.)	3	Core Curriculum	2	Choose HM with Advisor	3
MATH 155		Discrete Structures	3	ECON 205		Principles of Macroeconomics (SO-CK) (Req.)	3
MATH 207		Calculus* (MA) (Req.)	4	MATH 208		Calculus II	4
				MATH 254		Discrete Mathematics	3
See catalog for prereq.		TOTAL	16	Take Praxis I		TOTAL	17

FALL				SPRING			
Sub./Course No.	Tier	Second Year Title	Credit	Sub./Course No.	Tier	Second Year Title	Credit
Core Curriculum	2	Choose Art with advisor	3	Core Curriculum		Choose Wellness (WE)	3
MATH 309		Calculus III	4	MATH 307		Linear Algebra	3
EDUC 200	2	Foundations of Education (SO-MD)	3	EDUC 360		Survey of Exceptional Children (SO-MD)	3
PHYS 221 and 221L		General Physics I with General Physics I Lab	4	PHYS 222 and 222L		General Physics II with General Physics II Lab	4
Elective			1	Elective			3
		TOTAL	15	Take Praxis I		TOTAL	16

FALL				SPRING			
Sub./Course No.	Tier	Third Year Title	Credit	Sub./Course No.	Tier	Third Year Title	Credit
EDUC 320		Social / Psychological Conditions of Learning	4	EDUC 370		Creating Learning Environments	3
MATH 310		Differential Equations	4	EDUC 380		Innovative Technology	3
MATH 312		Introduction to Abstract Algebra	3	MATH 329		Modeling	3
EDUC 420		Special Methods for Mathematics	3	MATH 314		Statistics	3
				Elective			3
<i>Apply for Juncture 1</i>		TOTAL	14			TOTAL	15

FALL				SPRING			
Sub./Course No.	Tier	Fourth Year Title	Credit	Sub./Course No.	Tier	Fourth Year Title	Credit
EDUC 400		Inclusion in the Regular Classroom	3	EDUC 456		Student Teaching (5-Adult) (CP)	9
EDUC 443	2	Reading in the Content Area (WV)	3	EDUC 461**	3	Student Teaching Seminar (WM)	3
MATH 304		History of Mathematics	3				
MATH 303		Intro to Geometry	3			TOTAL	12
Elective			3				
<i>Take Praxis II</i>						DEGREE TOTAL	120
<i>Apply for Juncture 2</i>		TOTAL	15				

**EDUC 461 is designated as the Writing in the Major course for Education.

Math Education (Grades 5-Adult), B.A.

Shepherd University EPP Admissions Requirements

Juncture I Requirements:

- Must have an overall GPA of 2.75 and a 2.75 Shepherd GPA (incl. Transfer Students).
- Must have a C or better in all Specialty and Professional Courses (speak with your advisor).
- Must have passed the PRAXIS I Core or provided proof of exemption as determined/required by the State of West Virginia. *Please speak with your advisor regarding the exemptions/requirements/deadlines regarding the PRAXIS I Core exams.*
- Contact your advisor with any questions about any additional course work or requirements that must be completed before applying for Juncture I.

Juncture II Requirements:

- Must have an overall GPA of 2.75 and a 2.75 Shepherd GPA (incl. Transfer Students).
- Must have a C or better in all Specialty and Professional Courses (speak with your advisor).
- Must have an overall 2.75 GPA in Specialty and Professional Courses (speak with your advisor).
- You must pass all PRAXIS II Content exams before you will be permitted to student teach. *Please speak with your advisor regarding the deadlines for passing the PRAXIS II Content exams.*

For policies and procedures related to all teacher candidates within the EPP at Shepherd, review the [EPP Student Handbook](#) and/or the [Practicum Manual](#) and/or [School of Education website](#). For more specific information regarding your program and its requirements, contact your specialization coordinator.

Secondary Education: Mathematics Specialization

Required Math Classes from the Core

- **COMM 202 - Fundamentals of Speech (3 cr)** A required course for all students with focus upon the skills of sending and receiving clear messages. Audience analysis, the organization of the message, listening awareness, and the management of communication apprehension are foremost among the course objectives. Students participate in communication exercises and deliver a variety of speeches of different formats.
- **ECON 205 - Principles of Macroeconomics (3 cr)** Introduction to fundamental economic concepts including production possibilities and economic growth, market supply and demand analysis, money, banking, and government fiscal and monetary policies. Emphasis is placed upon fluctuations in national income, employment, and the price level. Prerequisites: Qualifying Mathematics placement scores of ACT 19 or SAT 460 (old exam) or 500 (new exam); or MATH 101 or higher.
- **MATH 207 - Calculus I (4 cr)** Fundamental concepts of calculus, using analytic geometry. After preliminaries about the real number system, intervals, and functions, properties of limits are carefully stated. These are used to develop standard differentiation formulas. Applications of the derivative (as a rate of change) are stressed in a wide variety of problems. Introduction to integration via anti-differentiation and area and the fundamental theorem. Applications of the integral (volumes, arc length, surface area, etc.) Prerequisites: [MATH 108](#) or satisfactory math placement score of ACT 25 or SAT 580 (old exam) or 600 (new exam).
- **PHYS 221 - General Physics I (3 cr)** A calculus-based treatment of fundamentals of selected classical physics topics including motion, force, Newton's laws, energy, momentum, gravitation, rotation, acoustics, fluid dynamics, and thermodynamics. [PHYS 221L](#) must be taken concurrently with PHYS 221. Prerequisite/corequisite: [MATH 207](#).
- **PHYS 221L - General Physics I Laboratory (1 cr)** A two hour per week laboratory course focusing on selected classical physics topics including motion, force, Newton's laws, energy, momentum, gravitation, rotation, acoustics, fluid dynamics, and thermodynamics. Corequisite: Must be taken concurrently with [PHYS 221](#).
- **PHYS 222 - General Physics II (3 cr)** A calculus-based treatment of the fundamentals of selected classical and modern physics topics including acoustics, fluid dynamics, thermodynamics, electromagnetism, optics, relativity, and quantum mechanics. Prerequisites: [PHYS 221](#). Corequisite: [PHYS 222L](#) must be taken concurrently with PHYS 222.
- **PHYS 222L - General Physics II Laboratory (1 cr)** A two hour per week laboratory course focusing on selected classical and modern physics topics including acoustics, fluid dynamics, thermodynamics, electromagnetism, optics, relativity, and quantum mechanics. Must be taken concurrently with [PHYS 222](#). Prerequisites: [PHYS 221L](#).

Required Math Coursework

- **MATH 208 - Calculus II (4 cr)** Continuation of MATH 207. Calculus of exponential, logarithmic, and trigonometric functions; techniques of integration. Review of conic sections in standard form and in rotation. Polar coordinates, l'Hôpital's rule, improper integrals, infinite series, and Taylor series. Prerequisites: [MATH 207](#).
- **MATH 254 - Discrete Mathematics (3 cr)** Topics from modern mathematics with particular emphasis on those with applications to computer science. Logic, sets, number systems and number theory, enumeration, graphs and trees, matrices, finite algebraic systems, and analysis of algorithms are examined. Prerequisites: [MATH 154](#) or [MATH 155](#); or [MATH 205](#) or [MATH 207](#).
- **MATH 309 - Calculus III (4 cr)** Continuation of MATH 208. Vectors in the plane and in space, parametric equations, solid analytic geometry. Calculus of functions of several variables including partial derivatives, multiple integrals, and their applications. Prerequisites: [MATH 208](#).
- **MATH 310 - Differential Equations (4 cr)** Examines first order ordinary differential equations (e.g., exact, separable, Bernoulli, homogeneous), direction field, numerical solution; higher order equations including the methods of Lagrange and undetermined coefficients; Laplace transforms; systems of first order equations; introduction to Fourier series; and applications in the physical and biological sciences. Prerequisites: [MATH 208](#), and [MATH 307](#).
- **MATH 329 - Mathematical Modeling (3 cr)** A study of how to model the world around us using mathematics, how to solve the resulting equations, and how to apply the results. Includes a thorough study of how to use both quantitative and qualitative solution behavior in the modeling process. Prerequisites: [MATH 321](#) and [MATH 310](#).
- **MATH 307 - Introduction to Linear Algebra (3 cr)** The course begins with a study of linear systems, using matrices and determinants to solve them. Vector spaces are treated axiomatically and discussed geometrically. Linear transformation of vector spaces and their matrix representations are considered. Finally eigenvectors and eigenvalues are considered with applications. Prerequisites: [MATH 155](#) or [MATH 254](#), and [MATH 207](#) or [MATH 205](#).
- **MATH 312 - Introduction to Abstract Algebra (3 cr)** Introduction to algebraic structures such as groups, rings, and fields. Formal development of their properties, complemented by examples and applications. Prerequisites: [MATH 208](#), [MATH 307](#), and [MATH 254](#).
- **MATH 314 - Statistics (3 cr)** This is a first course in statistics, primarily for those needing knowledge of statistical methods and the interpretation of statistical data. It discusses basic probability ideas, then deals with frequency distributions, measures of central tendency and dispersion; hypothesis testing using z, t, and chi-square tests; correlation, linear regression, and one-way ANOVA. For reinforcement, students must complete several laboratory assignments using statistical software. Students may not receive credit for both this course and [BADM 224](#). Prerequisites: [MATH 105](#) or [MATH 108](#) or [MATH 154](#) or higher, or permission of chair.
- **MATH 303 - Introduction to Geometry (3 cr)** Rigorous treatment of foundations of Euclidean geometry and an introduction to non-Euclidean geometries. Additional topics include transformational geometry, coordinate geometry, congruence, similarity and constructions. Course provides an historical development of significant geometries. Prerequisites: [MATH 254](#), and either [MATH 205](#) or [MATH 207](#).
- **MATH 304 - History of Mathematics (3 cr)** This course is designed to develop an appreciation of the contributions made by various cultures to the growth and development of mathematical ideas; investigate the contributions made by individuals, both female and male, and from a variety of cultures, in the development of ancient, modern and current mathematical topics; and gain an understanding of the historical development of major mathematics concepts. Prerequisites: [MATH 254](#), and either [MATH 205](#) or [MATH 207](#).

Teaching Endorsement / Grades 5-9 – General Math through Algebra I

The Mathematics 5-9 program, which offers a subject specialization for certification, is intended primarily for students preparing to teach in middle schools. [This endorsement is offered only as an add-on to the K-6 elementary program or to any of the secondary programs.](#)

Curriculum for Endorsement in Mathematics Teaching Field Grades 5-9 General Mathematics through Algebra I

This endorsement is offered as an add-on to the K-6 elementary program or to any of the secondary programs.

Total hours required, 20 Hours:

Content skill level:

- [MATH 108 - Precalculus](#) (4 cr)
- [MATH 205 - Calculus With Applications](#) (4 cr)
- [MATH 303 - Introduction to Geometry](#) (3cr)

Additional mathematics for education:

- [MATH 254 - Discrete Mathematics](#) (3 cr)
- [MATH 304 - History of Mathematics](#) (3cr)
- [MATH 314 - Statistics](#) (3 cr)

Note(s):

See professional education course listings under Education: Professional Studies Core for Endorsement in Middle School Education (40-48 hours required). Special Methods of Teaching Mathematics is [EDUC 420](#).

Four-Year Course Progression – Fall 2022 Catalog Grades 5-9 Endorsement

FALL				SPRING			
Sub./Course No.	Tier	Title	Credit	Sub./Course No.	Tier	Title	Credit
MATH 105		College Algebra	3	MATH 108		Precalculus	4
				MATH 314		Statistics	3
SECOND YEAR				SECOND YEAR			
Sub./Course No.	Tier	Title	Credit	Sub./Course No.	Tier	Title	Credit
MATH 205		Calculus with Applications	4	MATH 254		Discrete Mathematics	3
THIRD YEAR				THIRD YEAR			
Sub./Course No.	Tier	Title	Credit	Sub./Course No.	Tier	Title	Credit
EDUC 420		Special Methods for Mathematics	3	MATH 303		Geometry	3
				MATH 304		History of Mathematics	3
						Math Endorsement (Grades 5-9)	

Visit the following links for detailed description of these programs and course choices:

[Mathematics Teaching Field Grades 5-Adult, B.A.](#)
[Mathematics Teaching Field Endorsement Grades 5-9](#)