

**M.A.T. in Secondary Education**

## Biology Endorsement Course Checklist

Catalog Year 2023-2024

**Pedagogical Knowledge & Pedagogical Content Knowledge Requirements****Courses Required for Teacher Education Program Admission:** Grade of "C" or higher required in each course.

Requirement	Course	Course Title	Credits	Pre/Co-Requisites/Notes	Semester Offered
<input type="checkbox"/>	EDUC 200 <sup>1</sup>	Foundations of Education in the United States	3		FA/SP/SU
<input type="checkbox"/>	PSYC 160 <sup>1</sup>	Life Span Human Development	3	C5SD	FA/SP/SU
<input type="checkbox"/>	WRTC 103	Rhetorical Reading and Writing	3	C1W	FA/SP/SU

**Secondary Education Undergraduate Coursework:** Grades of "B-" or higher required in all courses unless otherwise indicated.

Requirement	Course	Course Title	Credits	Pre/Co-Requisites/Notes	Semester Offered
<input type="checkbox"/>	MSSE 101 <i>or</i> CSM 199	Orientation to the Profession <i>or</i> Science Outreach in Schools	1		FA/SP SP
<input type="checkbox"/>	EDUC 200 <sup>1</sup>	Foundations of Education in the United States	3	Required for Teacher Education admission; grade of "C" or higher	FA/SP/SU
<input type="checkbox"/>	EDUC 310	Teaching in a Diverse Society	3	1,2	FA/SP/SU
<input type="checkbox"/>	MSSE 370	General Instructional Methods for Grades 6-12	3	1,3	FA/SP
<input type="checkbox"/>	MSSE 371 <i>or</i> MSSE 430	Clinical Experience in Adolescent Education <i>or</i> Introduction to Mentoring Valley Scholars	1 3	1,3	FA/SP FA
<input type="checkbox"/>	MSSE 414	Natural Sciences Teaching Methods, Grades 6-8	3	1,3,4; C: MSSE 415	FA
<input type="checkbox"/>	MSSE 415	Content Area Field Experience in Middle Schools	3	1,3,4; C: MSSE 414	FA
<input type="checkbox"/>	LED 440	Disciplinary Literacy in Secondary Educ.	3	1,3,4	FA/SP

<sup>1</sup> Pre-professional Secondary Education minor declared & approved<sup>2</sup> Application to the Teacher Education Program required<sup>3</sup> Admission to the Teacher Education Program required<sup>4</sup> Completion of MSSE 370**Mandatory Tasks:**

- Be admitted to the Teacher Education Program before you enroll in MSSE 370 and MSSE 371.
- Attend a Student Teaching Information Meeting in the Fall of your senior year and apply to Student Teaching by October 31 of your senior year.
- Apply to The Graduate School no later than November 15 of your senior year for Spring admission or no later than April 1 of your senior year for Summer admission. Earlier is better to have a transcript review prior to your final undergraduate semester and to be able to enroll during your enrollment appointment.
- Attempt your Praxis Subject Assessment no later than March 1 of your senior year and pass it no later than August 15.

**College of Education** Department of Middle, Secondary, and Mathematics EducationMemorial Hall, 395 S. High Street, Room 3200, MSC 6912 Harrisonburg, VA 22807 | (540) 568-6486 | <https://www.jmu.edu/coe/msme/>

*This document is provided as an advising resource only. Official curriculum requirements are listed in the JMU Undergraduate Catalog and the JMU Graduate Catalog. In the case of discrepancies, the University Catalog is the official curriculum students must follow. This document was reviewed by the Middle, Secondary, and Mathematics Education Academic Unit Head on June 1, 2023.*

**Secondary Education Graduate Coursework:** Grades of "B-" or higher required in all courses unless otherwise indicated.

Requirement	Course	Course Title	Credits	Pre/Co-Requisites/Notes	Semester Offered	
<input type="checkbox"/>	EDUC 540	Educational Technology	3	1,2	SP/SU	
<input type="checkbox"/>	EXED 512	Behavior Management in the Classroom	3	1,2	SP/SU	
<input type="checkbox"/>	MSSE 607	Curriculum Theory in a Diverse Society	3	1,2	FA/SU	
<input type="checkbox"/>	MSSE 625	Assessment of and for Learning	3	1,2	SP/SU	
<input type="checkbox"/>	EXED 520	Differentiation of Instruction and Assessment to Meet the Needs of Diverse Learners	3	1,2	FA/SP	
<input type="checkbox"/>	High School Teaching Methods and Practicum	MSSE 544	Natural Sciences Teaching Methods, Grades 9-12	3	2,3; C: MSSE 549	FA
<input type="checkbox"/>		MSSE 549	Field Experience in High School Natural Science	3	2,3; C: MSSE 544	FA
<input type="checkbox"/>		MSSE 630	Research for Practitioners	3	2,3	FA
<input type="checkbox"/>		MSSE 650	Internship Seminar	3	2,3,4; C: MSSE 675	SP
<input type="checkbox"/>	Student Teaching #1	MSSE 675	Internship in Middle and Secondary Educ.	3	2,3,4; C: MSSE 650	SP
<input type="checkbox"/>	Student Teaching #2	MSSE 675	Internship in Middle and Secondary Educ.	3	2,3,4; C: MSSE 650	SP

<sup>1</sup> Conditionally admitted to the graduate program

<sup>2</sup> Admission to the Teacher Education Program required

<sup>3</sup> Unconditionally admitted to the graduate program

<sup>4</sup> Passing score on Praxis Subject Assessment

## B.S. Degree Requirements (6 credits)

For guidance on courses to satisfy your degree requirements: [https://www.jmu.edu/registrar/ba\\_and\\_bs\\_degree\\_courses.shtml](https://www.jmu.edu/registrar/ba_and_bs_degree_courses.shtml).

Requirement	Course	Course Title	Credits	Pre/Co-Requisites/Notes	Semester Offered	
<input type="checkbox"/>	Scientific Literacy	BIO 150	Foundations of Biology II	3	P: "C-" or higher in BIO 140 and BIO 140L; C: BIO 150L	FA/SP
<input type="checkbox"/>	Quantitative Reasoning			3	Second math course in Biology major	

## Biology Content Knowledge Licensure Requirements...

...as they fit with the JMU Biology - BS major.

Requirement	Course	Course Title	Credits	Pre/Co-Requisites/Notes	Semester Offered	
<b>Biology Major Core</b>						
<input type="checkbox"/>	VDOE: biochemistry/ molecular bio; cell bio	BIO 140	Foundations of Biology I (C3NS)	3	C: BIO 140L	FA/SP
<input type="checkbox"/>		BIO 140L	Foundations of Biology I Laboratory (C3L)	1	C: BIO 140	
<input type="checkbox"/>		BIO 150	Foundations of Biology II	3	P: "C-" or higher in BIO 140 and BIO 140L; C: BIO 150L	FA/SP
<input type="checkbox"/>		BIO 150L	Foundations of Biology II Laboratory	1	P: "C-" or higher in BIO 140 and BIO 140L; C: BIO 150	
<input type="checkbox"/>	VDOE: genetics; biochemistry/ molecular biology	BIO 240	Genetics	3	P: "C-" or higher in BIO 150 and BIO 150L; C: BIO 240L	FA/SP
<input type="checkbox"/>		BIO 240L	Genetics Laboratory	1	P: "C-" or higher in BIO 150 and BIO 150L; C: BIO 240	
<input type="checkbox"/>	VDOE: ecology and evolution	BIO 250	Quantitative Ecology and Evolution	3	P: "C-" or higher in BIO 150 and BIO 150L, or GEOL 110, GEOG 210, or ISAT 112; C: BIO 250L	FA/SP
<input type="checkbox"/>		BIO 250L	Quantitative Ecology and Evolution Laboratory	1	P: "C-" or higher in BIO 150 and BIO 150L, or GEOL 110, GEOG 210, or ISAT 112; C: BIO 250	

Requirement	Course	Course Title	Credits	Pre/Co-Requisites/Notes	Semester Offered
<b>Biology Elective Courses – 24 credits</b>					
<i>Courses may count for multiple requirements listed below. List the course code and credit hours on the lines provided for each category. Not all lines may be used. See the Biology major in the Undergraduate Catalog for more information.</i>					
•	Up to 8 credit hours of 200-level Biology courses may count (except for BIO 270 and BIO 270L)	-----	-----		
•	Minimum 16 credits must be from 300/400-level courses:	-----	-----		
•	One course must be on "organismal diversity*" – see approved list in Catalog or Academic Requirements Report:	-----			
•	Two courses must have a laboratory* component – see approved list in Catalog or Academic Requirements Report:	-----	-----		
•	For VDOE licensure, one class each must be taken in zoology*, botany*, and anatomy & physiology*):				
○	Zoology*: -----				
○	Botany*: -----				
○	Anatomy & Physiology*: -----				
•	Total Upper-Level Biology Credit hours: -----				
<b>Cognate Courses</b>					
<input type="checkbox"/>		CHEM 131 General Chemistry I (C3PP)	3	C: CHEM 131L or CHEM 135L	FA/SP/SU
<input type="checkbox"/>		CHEM 131L General Chemistry Laboratory I (C3L)	1	C: CHEM 131	FA/SP/SU
<input type="checkbox"/>	BIO/VDOE: Chemistry requirement	CHEM 132 General Chemistry II	3	P: "C-" or higher in CHEM 131 and CHEM 131L or CHEM 135L	FA/SP/SU
<input type="checkbox"/>		CHEM 132L General Chemistry Laboratory II	1	132 C: CHEM 132L or CHEM 136L 132L C: CHEM 132	FA/SP/SU
<input type="checkbox"/>	BIO/VDOE: Organic Chemistry requirement;	CHEM 241 Organic Chemistry I	3	P: "C-" or higher in CHEM 132	FA/SP/SU
	recommend CHEM 355 if don't already have credit for a geology/Earth Science course	CHEM 242 or Organic Chemistry II or	3	242 P: "C-" or higher in CHEM 241	SP/SU
<input type="checkbox"/>		CHEM 361 or Biochemistry I or	3	361 P: CHEM 241 & inst. permis.	FA/SP
		CHEM 355 Geochemistry of Natural Waters	3	355 P: CHEM 131 & CHEM 132	FA
<input type="checkbox"/>	BIO/VDOE: Statistics (choose one)	MATH 220 or Elementary Statistics (C3QR) or	3	220 P: "C-" or higher in MATH 105 or ALEKS	FA/SP/SU
		MATH 229 or Intro. to Applied Statistics Using R (C3QR) or	3	229 P: "C-" or higher in MATH 231 or ALEKS	FA/SP
		MATH 285 or Data Analysis or	4	285: MATH 206, MATH 236, or instructor permission	
		MATH 318 Intro to Probability and Statistics	4	318 P: MATH 236	FA/SP/SU
<input type="checkbox"/>	BIO: 2 <sup>nd</sup> Math Requirement (choose one)	MATH 231 or Calculus with Functions I (C3QR) or	3		FA/SP/SU
		MATH 235 or Calculus I (C3QR) or	4	231 P: MATH 155, 156 or ALEKS	FA/SP/SU
		MATH 268 or Data Analysis and Visualization or	3		SP
		MATH 309 or SAS Programming and Data Management or	3	235 P: ALEKS	FA/SP
		MATH 321 or Analysis of Variance & Exp. Design or	3		FA/SP
		MATH 322 or Applied Linear Regression or	3	268: MATH 220, or MATH 318	FA/SP
		MATH 324 or Applied Nonparametric Statistics or	3	and instructor permission	SP
		MATH 325 or Survey Sampling Methods or	3		FA
		MATH 327 or Categorical Data Analysis or	3		FA/SP
		MATH 354/BIO Introduction to Biometrics or	4	309/321/322/324/325/327/354:	SP
		454 or		MATH 220, MATH 229, MATH 318 or equivalent	
		MATH 368 or Statistical Computing or	3		FA
		DATA 200 Introduction to Data	3		

Requirement	Course	Course Title	Credits	Pre/Co-Requisites/Notes	Semester Offered
<input type="checkbox"/>	PHYS 140	College Physics I (C3PP)	3	C: PHYS 140L	FA/SP/SU
<input type="checkbox"/>	PHYS 140L	General Physics Laboratory I (C3L)	1	C: PHYS 140	FA/SP/SU
<input type="checkbox"/>	PHYS 150	College Physics II	3	P: "C-" or higher in PHYS 140; C: PHYS 150L	SP/SU
<input type="checkbox"/>	PHYS 150L	General Physics Laboratory II	1	P: "C-" or higher in PHYS 140; C: PHYS 150	SP/SU

**Please contact the Biology Department with questions about the Biology major or Biology coursework.**

\*See the Biology Major in the JMU Undergraduate Catalog for a list of approved Organismal Diversity and Laboratory courses. See below for MSME pre-approved zoology, botany, and anatomy/physiology courses.

### Zoology

BIO 310 Marine Biology  
 BIO 312 Animal Welfare  
 BIO 316 Animal Development  
 BIO 320 Comparative Anatomy of Vertebrates<sup>1</sup>  
 BIO 350 Paleobiology  
 BIO 370 Animal Physiology<sup>1</sup>  
 BIO 395 Comparative Animal Behavior  
 BIO 412 Mammalogy  
 BIO 430 Ornithology: Research and Current Advances  
 BIO 449 Insect Ecology  
 BIO 426 Topics in Biology<sup>2</sup>  
 BIO 427 Topics in Biology with Laboratory<sup>2</sup>

### Botany

BIO 360 Plant Biology  
 BIO 364 Human Uses of Plants  
 BIO 386 Field Botany  
 BIO 402 Forest Ecology  
 BIO 455 Plant Physiology  
 BIO 486 Systematics of Vascular Plants  
 BIO 426 Topics in Biology<sup>2</sup>  
 BIO 427 Topics in Biology with Laboratory<sup>2</sup>

### Anatomy/Physiology

BIO 260 Foundations of Human Anatomy & Physiology  
 BIO 270 Human Physiology (lab co-requisite)<sup>3</sup>  
 BIO 290 Human Anatomy (lab co-requisite)  
 BIO 320 Comparative Anatomy of Vertebrates<sup>1</sup>  
 BIO 370 Animal Physiology<sup>1</sup>  
 BIO 426 Topics in Biology<sup>2</sup>  
 BIO 427 Topics in Biology with Laboratory<sup>2</sup>

<sup>1</sup>Students should complete unique courses in each category in order to have a broad preparation in the subject area.

<sup>2</sup>Consult with your Biology major advisor to determine if a topic would meet licensure requirements.

<sup>3</sup>This course will not meet Biology major requirements

**Not part of the Biology major but required for a Biology Teaching Endorsement.**

<input type="checkbox"/>	VDOE: Earth Science requirement		3	Recommend CHEM/GEOL 355 to overlap with Biology major	
--------------------------	---------------------------------	--	---	---	--

## General Education Requirements

Be sure to follow the General Education course suggestions listed below for maximum overlap of the General Education Program with your Pre-Professional Secondary Education minor and Biology major.

Requirement	Course	Course Title	Credits	Pre/Co-Requisites/Notes	Semester Offered
<b>MADISON FOUNDATIONS</b>					
<input type="checkbox"/>	Critical Thinking (C1CT)		3		FA/SP/SU
<input type="checkbox"/>	Human Communication (C1HC)		3	Choose any option from the General Education Planner.	FA/SP/SU
<input type="checkbox"/>	Writing (C1W)	WRTC 103 Rhetorical Reading and Writing	3	Must earn a C or higher.	FA/SP/SU
<b>ARTS AND HUMANITIES</b>					
<input type="checkbox"/>	Human Questions and Contexts (C2HQC)		3		FA/SP/SU
<input type="checkbox"/>	Visual and Performing Arts (C2VPA)		3	Choose any option from the General Education Planner.	FA/SP/SU
<input type="checkbox"/>	Literature (C2L)		3		FA/SP/SU

Requirement	Course	Course Title	Credits	Pre/Co-Requisites/Notes	Semester Offered	
<b>THE NATURAL WORLD</b>						
<input type="checkbox"/>	Quantitative Reasoning (C3QR)	MATH 220 <i>or</i>	Elementary Statistics (C3QR) <i>or</i>	3	220 P: "C-" or higher in MATH 105 or ALEKS	FA/SP/SU
		MATH 229 <i>or</i>	Intro. to Applied Statistics Using R (C3QR) <i>or</i>	3	229 P: "C-" or higher in MATH 231 or ALEKS	FA/SP
		MATH 231 <i>or</i>	Calculus with Functions I <i>or</i>	3	231 P: MATH 155, 156 or ALEKS	FA/SP/SU
		MATH 235	Calculus I	4	235 P: ALEKS	FA/SP/SU
<input type="checkbox"/>	Physical Principles (C3PP)	CHEM 131	General Chemistry I	3	C: CHEM 131L or CHEM 135L	FA/SP/SU
<input type="checkbox"/>	Natural Systems (C3NS)	BIO 140	Foundations of Biology I	3	C: BIO 140L	FA/SP
<input type="checkbox"/>	Lab Experience (C3Lab)	BIO 140L	Foundations of Biology I Laboratory	1	C: BIO 140	FA/SP
<b>AMERICAN AND GLOBAL PERSPECTIVES</b>						
<input type="checkbox"/>	The American Experience (C4AE)			4	Choose any option from the General Education Planner.	FA/SP/SU
<input type="checkbox"/>	The Global Experience (C4GE)			3		FA/SP/SU
<b>SOCIOCULTURAL AND WELLNESS AREA</b>						
<input type="checkbox"/>	Wellness Domain (C5WD)			3	Choose any option from the General Education Planner.	FA/SP/SU
<input type="checkbox"/>	Sociocultural Domain (C5SD)	PSYC 160	Life Span Human Development	3	Must earn a C or higher.	FA/SP/SU