

III. Mathematics, Physics and Statistics

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Students with Advanced Placement credit:

Requirements for courses in mathematical sciences can be met through Advanced Placement exam credit. The College awards the following credit for AP scores:

AP Subject	AP Exam Score	Hrs Credit	MC Courses Credited
Math: Calculus AB	3	3	MATH 108
	4, 5	4	MATH 111 (enroll in 112)
Math: Calculus BC	3 with AB subscore 3	3	MATH 108
	3 with AB subscore 4,5	4	MATH 111 (enroll in 112)
	4,5	8	MATH 111, 112 (enroll in 211)
Physics 1	3, 4, 5	4	PHYS 201* (enroll in 202)
Physics 2	3, 4, 5	4	PHYS 202*
Physics C: Mechanics	3,4,5	4	PHYS 211 (enroll in PHYS 212)
Physics C: Electricity & Magnetism	3,4,5	4	PHYS 212
Statistics	3,4,5	3	STAT 269 (enroll in STAT 291)** or STAT 281

* Mathematics majors are required to take the PHYS 211/212 sequence rather than PHYS 201/202. However, if a student in the mathematics major receives AP credit for both PHYS 201 and 202, the 211/212 requirements are waived.

** AP Statistics is not a calculus-based course or exam. Mathematics majors who receive AP credit for Statistics are still required to take STAT 291 for the major requirement.

8-semester guides

Actuarial Science (B.S.)

Course #	Course name	Credits	Course #	Course name	Credits
First Year – Fall			First Year - Spring		
COMM 105	Fundamentals of Oral Communication*	3	MATH 112	Calculus II with lab	4
MATH 111	Calculus I with lab	4	MATH 195	First-Year Math Seminar	3
ECON 120	Principles of Macroeconomics	3	ACCT 131	Survey of Accounting	3
IDFY 101	First-Year Seminar*	3	Varies	2 nd semester of language*	3
Varies	1 st semester of language*	3	IDCR 151	Created and Called for Community*	3
TOTAL		16	TOTAL		16
Sophomore –Fall			Sophomore – Spring		
MATH 211	Calculus III with lab	4	MATH 261	Linear Algebra	3
STAT 291	Statistics for the Mathematical Sciences I	3	Varies	3 rd semester of Language or Cross Cultural*	3
ENGL 1xx	Literature meeting QuEST*	3	Varies	Philosophy or Religion meeting QuEST*	3
ECON 220	Principles of Microeconomics	3	STAT 292	Statistics for the Mathematical Sciences II	3
BIBL 201/203/204	Bible*	3	CIS 181	Computer Programming I	3
TOTAL		16	TOTAL		15
Junior – Fall			Junior – Spring		
FINA 350	Financial Management	3	THEO 205-238	Christian Beliefs*	3
HIST 1xx	US/European History meeting QuEST*	3	INTE 391	Internship	3
MATH 350 or STAT 407	Mathematics of Finance I OR Introduction to Mathematical Statistics**	3	MATH 351 or STAT 345	Mathematics of Finance II OR Time Series Analysis**	3
PHYS 211	General Physics I with lab	4	Varies	Art, Music, Theatre or Dance meeting QuEST*	3
TOTAL		13	TOTAL		12
Senior – Fall			Senior – Spring		
MATH 350 or STAT 407	Mathematics of Finance I OR Introduction to Mathematical Statistics**	3	MATH 351 or STAT 345	Mathematics of Finance II OR Time Series Analysis**	3
IDNW 2xx	Non-western Studies*	2-3	MATH 494	Senior Math Seminar	3
WELL 1xx	Wellness*	1	Varies	Ethics/WV/Pluralism*	3
MATH 362	Algebraic Structures	3	MATH 412	Real Analysis	3
FINA 307/351/405	Upper Level Finance Elective	3			
TOTAL		12-13	TOTAL		12

* QuEST requirement

** These pairs of courses are offered in alternate years. MATH 350/351 should be taken Fall/Spring whichever year it is offered and STAT 407/345 should be taken Fall/Spring in the alternate year.

NOTE: The major includes 10-11 free elective credits. These should be used to fill the lower credit semesters. Also, the Department suggests that student in this major could consider a minor in a related area to make best use of the elective credits and additional space in this plan.

Mathematics (B.A.) 8 Semester Plan

Course #	Course name	Credits	Course #	Course name	Credits
First Year – Fall			First Year - Spring		
COMM 105	Fundamentals of Oral Communication*	3	MATH 112	Calculus II with lab	4
MATH 111	Calculus I with lab*	4	MATH 195	First-Year Math Seminar	3
ECON 120	Macroeconomics	3	PHYS 211	General Physics I with lab	4
IDFY 101	First-Year Seminar*	3	Varies	2 nd semester of Language*	3
Varies	1 st semester of Language*	3	IDCR 151	Created and Called for Community*	3
TOTAL		16	TOTAL		17
Sophomore –Fall			Sophomore – Spring		
MATH 211	Calculus III with lab	4	MATH 261	Linear Algebra	3
STAT 291	Statistics for the Mathematical Sciences I	3	Varies	3 rd semester of Language or Cross Cultural*	3
ENGL 1xx	Literature meeting QuEST*	3	Varies	Philosophy or Religion*	3
PHYS 212	General Physics II with lab	4	CIS 284 or STAT 292	Computer Programming II OR Statistics for the Mathematical Sciences II	3
CIS 181	Computer Programming I	3			
TOTAL		17	TOTAL		12
Junior – Fall			Junior – Spring		
MATH 362	Algebraic Structures	3	MATH 308/382	Differential Equations/Geometry**	3
HIST 1xx	US/European History meeting QuEST*	3	MATH 412	Real Analysis ^o	3
MATH/STAT 3xx/4xx	Upper Level Math/Stat Elective	3	THEO 205-238	Christian Beliefs*	3
BIBL 201/203/204	Bible*	3	Varies	Art, Music, Dance, Theatre meeting QuEST*	3
TOTAL		12	TOTAL		12
Senior – Fall			Senior – Spring		
MATH/STAT 3xx/4xx	Upper Level Math/Stat Elective	3	MATH 308/382	Differential Equations/Geometry**	3
IDNW 2xx	Non-western Studies*	2-3	MATH 494	Senior Math Seminar	3
WELL 1xx	Wellness*	1	Varies	Ethics/WV/Pluralism*	3
Varies	Free Elective	3	Varies	Free Elective	3
Varies	Free Elective	3			
TOTAL		12-13	TOTAL		12

*Fulfills QuEST requirement

**Offered spring of odd-numbered years.

^oMay be taken in either the 3rd or 4th year of spring.

**Mathematics with Teaching Certification (B.A.)
8 Semester Plan**

Course #	Course name	Credits	Course #	Course name	Credits
First Year – Fall			First Year - Spring		
COMM 105	Fundamentals of Oral Communication*	3	MATH 112	Calculus II with lab	4
MATH 111	Calculus I with lab*	4	MATH 195	First-Year Math Seminar	3
CIS 181/191	Comp. Prog. I/Web Dev. 1: Client Side	3	ENGL 122-176	Literature meeting QuEST*	3
IDFY 101	First-Year Seminar*^	3	Varies	2 nd semester of Language*	3
Varies	1 st semester of Language*	3	IDCR 151	Created and Called for Community*	3
			WELL 1xx	Wellness*	1
			<i>Submit the three required security clearances (FBI, Child Abuse, Criminal) by 3/31. Take PAPA exam (formerly Praxis 1).</i>		
TOTAL			TOTAL		
16			17		
Sophomore –Fall			Sophomore – Spring		
MATH 211	Calculus III with lab	4	MATH 261	Linear Algebra	3
STAT 291	Statistics for the Mathematical Sciences I	3	Varies	3 rd semester of Language or Cross Cultural*	3
EDUC 201	Education & American Society (or spring)	3	PHYS 211	General Physics I with lab	4
EDSP 207**	Introduction to Special Education	3	CIS 283/284/291 or STAT 292	Second semester Computing OR Statistics for the Mathematical Sciences II	3
EDUC 203**	Educational Psychology	3	EDUC 208	Teaching English Language Learners	3
TEP 210**	Sophomore Field Experience	0	<i>Submit Teacher Education Program application electronically by 3/31. Clearances completed last year must be less than one year old with applying.</i>		
TOTAL			TOTAL		
16			16		
Junior – Fall			Junior – Spring		
MATH 362	Algebraic Structures	3	MATH 308/382	Differential Equations/Geometry***	3
HIST xxx	US/European History meeting QuEST*	3	MATH 412	Real Analysis	3
PHYS 212	General Physics II with lab	4	MATH 307**	Secondary Math Instruction	2
Varies	Philosophy or Religion*	3	EDUC 331**	Instruct. Design & Assessment	3
BIBL 201/203/204	Bible*	3	EDSP 307**	Inclusion Practices	3
			TEP 310**	Junior Field Experience	
			HDFS 311	Adolescent Development	3
TOTAL			<i>Submit Professional Semester application electronically by 1/15.</i>		
16			TOTAL		
16			17		
Senior – Fall			Senior – Spring		
<i>Professional Semester</i>			MATH 308/382	Differential Equations/Geometry***	3
TEP 410**	Secondary Pre-student Teaching	0	MATH 494	Senior Math Seminar (take in Junior Spring if Student Teaching in Senior Spring)	3
TEP 435**	Student Teaching	9	Varies	Ethics/WV/Pluralism*	3
EDUC 420**	Professional Issues in Education	2	IDNW 2xx	Non-western Studies*	2-3
TEP 407**	Student Teaching Seminar	1	THEO 205-238	Christian Beliefs*	3
			Varies	Art, Music, Theatre or Dance meeting QuEST*	3
TOTAL			<i>Take Praxis II exam.</i>		
12			TOTAL		
12			17-18		

*Fulfills QuEST requirement

**Courses to be taken concurrently.

***Offered spring of odd-numbered years.

^This course, or its transfer equivalent, is required for admission into the Teacher Education Program

**Physics with Teaching Certification (B.A.)
8 Semester Plan**

Course #	Course name	Credits	Course #	Course name	Credits
First Year – Fall			First Year - Spring		
COMM 105	Oral Communication*	3	MATH 112	Calculus II	4
CHEM 105	General Chemistry I*	4	ENGL 122-176	Literature meeting QuEST*	3
CIS 181	Computer Programming I	3	PHYS 211	General Physics I	4
MATH 111	Calculus I*	4			
FYS 101	Varies	3			
			<i>Submit the three required security clearances (FBI, Child Abuse, Criminal) by 3/31 to cwickey@messiah.edu or B414.</i>		
	TOTAL	17		TOTAL	11
Sophomore –Fall			Sophomore – Spring		
MATH 211	Calculus III	4	PHYS 251	Modern Physics	4
PHYS 212	General Physics II	4	EDSP 207**	Introduction to Special Education+	3
EDUC 201	Education and Am. Society+	3	EDUC 203**	Educational Psychology+	3
PHIL 101 or 102	Gen. Ed. Philosophy*	3	TEP 210**	Sophomore Field Experience+	0
			MATH 270	Advanced Math for the Sciences	3
			ENGR 212	Programming for Engineers	2
			<i>Submit Teacher Education Program app by 3/31 to B414.</i>		
	TOTAL	14		TOTAL	15
Junior – Fall			Junior – Spring		
STAT 291 or ENGR 242	Statistics I OR Experimental Methods	3	PHYS 402 †	Quantum Mechanics	3
ENGR 367	Electromagnetics	3	PHYS 307	Secondary Mathematics/Physics Instruction	2
EDUC 331*	Instructional Design & Assessment	3	ENGR 371	Thermodynamics	3
EDSP 307**	Inclusion Practices	3	HDFS 311	Adolescent Development	3
TEP 310**	Junior Field Experience	0	Varies	Electives	6
EDUC 208	Teaching English Language Learners	3			
SCIE 307**	Teaching Lab Sciences in Secondary Education	2			
			<i>Submit Professional Semester application electronically by 1/15.</i>		
	TOTAL	17		TOTAL	17
Senior – Fall			Senior – Spring		
	<i>Professional Semester</i>				
TEP 410**	Pre-student Teaching	0	PHYS 494	Senior Physics Seminar	2
TEP 435**	Student Teaching	9	CHEM 495	Capstone; Natural Sciences	3
EDUC 420**	Professional Issues in Education	2	PHYS 328 †	Classical Mechanics	3
PHYS 407**	Secondary Physics Curriculum/ Instru.	1	PHYS 317 †	Optics	3
Varies	Elective	3	Varies	Elective	3
	TOTAL	15		TOTAL	14

*Fulfills QuEST requirement

**Must be taken concurrently

^This course, or its transfer equivalent, is required for admission into the Teacher Education Program

† Offered in alternating years

**Physics (B.S.)
8 Semester Plan**

Course #	Course Name	Credits	Course #	Course Name	Credits
First Year – Fall			First Year – Spring		
IDFY 101*	First year seminar	3	IDCR 151*	Created and Called	3
Varies*	1 st language requirement	3	Varies*	2 nd language requirement	3
COMM 105*	Foundations of Oral Communication	3	Varies*	1 st social science/history	3
MATH 111	Calculus I	4	MATH 112	Calculus II	4
CHEM 105	General Chemistry I	4	PHYS 211	General Physics I	4
		Total			Total
		17			17
Sophomore – Fall			Sophomore – Spring		
Varies*	3 rd language requirement	3	ENGL 1xx*	Literature meeting QuEST	3
BIBL 2xx*	Bible	3	PHIL 101*	Problems in Philosophy	3
MATH 308**	Differential Equations	3	ENGR 212	Programming For Engineers	3
MATH 211	Calculus III	4	PHYS 251	Modern Physics	4
PHYS 212	General Physics II	4	MATH 261**	Linear Algebra	3
		Total			Total
		17			16
Junior – Fall			Junior – Spring		
Varies*	2 nd social science/history	3	WELL 1xx*	Wellness	1
Varies*	Christian Beliefs	3	ENGR 242	Experimental Methods	3
PHYS 421†	Particle Physics	3	PHYS 402†	Quantum Mechanics	3
ENGR 367	Electromagnetics	3	ENGR 371	Thermodynamics	3
CHEM393	Research Methods	3	PHYS322***	Independent Research	3
		Total			Total
		15			13
Senior – Fall			Senior – Spring		
Varies*	Ethics, World View or Pluralism	3	PHYS 494	Senior Physics Seminar	2
PHYS 425†	Solid State Physics	3	PHYS 328†	Classical Mechanics	3
PHYS 422***	Senior Research	3	PHYS 317†	Optics	3
Varies*	Interdisciplinary	3	CHEM 495	Capstone Natural Sciences	3
			Varies	Free Elective	3
		Total			Total
		12			14

* Fulfills QuEST requirement

** Requirement can alternatively be met in as single semester by MATH 270

*** Recommended, but not required for degree

† Offered in alternating years

**Math and Physics (B.A.) double-major
8 Semester Plan**

Course #	Course name	Credits	Course #	Course name	Credits
First Year – Fall			First Year - Spring		
CIS 181	Computer Programming I	3	MATH 112	Calculus II	4
ECON 120	Introduction to Macroeconomics	3	MATH 195	First-Year Mathematics Seminar	3
MATH 111	Calculus I	4	PHYS 211	General Physics I	4
IDFY 151	First Year Seminar*	3	IDCR 151	Created and Called for Community*	3
Varies	First semester of language*	3	Varies	2 nd semester of Language*	3
TOTAL		16	TOTAL		17
Sophomore –Fall			Sophomore – Spring		
MATH 211	Calculus II	4	MATH 261	Linear Algebra	3
MATH 308	Differential Equations	3	PHYS 251	Modern Physics	4
STAT 291	Statistics for Math Sciences	3	STAT 292 or	Statistics for Mathematical Sciences OR	3
PHYS 212	General Physics II	4	CIS 283	Computer Programming II	3
CHEM 105	General Chemistry I	4	BIBL 20x	Knowledge of the Bible*	3
			WELL 1xx	Wellness Course*	1
TOTAL		18	TOTAL		18
Junior – Fall			Junior – Spring		
MATH 362	Algebraic Structures	3	PHYS 402	Quantum Mechanics	3
RELI/PHIL	Religion/Philosophy*	3	MATH/STAT 3XX	Mathematics Course	3
ENGR 367	Electromagnetics	3	THEO 2xx	Christian Beliefs*	3
HIST xxx	History meeting QuEST*	3	IDNW xx	Non-Western Studies*	2-3
ENGL xxx	Literature meeting QuEST*	3	Varies	Social Science meeting QuEST*	3
COMM 105	Fundamentals of Oral Communication*	3			
TOTAL		18	TOTAL		17-18
Senior – Fall			Senior – Spring		
CHEM 495	Capstone Natural Sciences	3	MATH 412	Real Analysis	3
Varies	Mathematics Course OR Linear Systems	3	MATH 494 or	Senior Math Seminar OR	2-3
IDS XXX	Ethics/Pluralism/World Views*	3	PHYS 494	Senior Physics Seminar	3
Varies	Art, Music, Theatre or Dance meeting QuEST*	3	PHYS 328	Classical Mechanics	3
ENGR 371 or CHEM 337	Thermodynamics OR Physical Chemistry I	3	Varies	Free Elective	3
TOTAL		15	TOTAL		14-15

*QuEST requirement