

PHYSICS MAJOR (B.S.) (COMBINED B.S./M.S. APPLIED MATHEMATICS)

A Combined Degree program enables undergraduate students to enroll in graduate courses in their senior year, which can be counted towards the completion of both their Bachelor's and Master's degree requirements.

The ability to take these "swing courses" allows students to earn both their Bachelor's and Master's degrees in a shortened period of time, typically within five years of intensive study. Undergraduate students interested in this option can find more information regarding program requirements on the University's Combined Programs website (<https://www.montclair.edu/combined-programs/programs-of-study/>).

Program Requirements Overview

Code	Title	Credits
	General Education Requirements	32
	World Languages and Cultures Requirements	3-6
	Major Requirements	68-70
	Graduate Swing Courses	12
	Free Electives	5-0
Total Credits		120

Major Requirements

Requirements for the graduate portion of this dual degree program can be found here. (<https://montclair-curr.courseleaf.com/programs/applied-mathematics-ms/>)

Code	Title	Credits
Physics Required Courses		
PHYS 191	University Physics I	4
PHYS 192	University Physics II	4
PHYS 198	Introductory Physics Seminar	1
PHYS 210	Intermediate Mechanics	3
PHYS 220	Oscillations, Waves, and Optics	3
PHYS 230	Intermediate Physics Laboratory	4
PHYS 300	Junior/Senior Physics Seminar	1
PHYS 320	Statistical and Thermal Physics	3
PHYS 330	Advanced Physics Laboratory	4
PHYS 340	Electricity and Magnetism	3
PHYS 360	Modern Physics	3
PHYS 464	Quantum Mechanics	3
Physics Elective Courses		
	Select 6-7 credits from the list below.	6-7
Physics Collateral Courses		
CHEM 120	General Chemistry I	4
CHEM 121	General Chemistry II	4
CSIT 104	Python Programming I	3
MATH 122	Calculus I	4
	or AMAT 120 Applied Calculus A	
MATH 221	Calculus II	4
	or AMAT 220 Applied Calculus B	
MATH 222	Calculus III	4

AMAT 350	Applied Mathematics I	3-4
	or MATH 325 Ordinary Differential Equation	
	or PHYS 377 Mathematical Physics	

Total Credits 68-70

Major Electives

Code	Title	Credits
PHYS 180	Astronomy for Everyone	4
PHYS 245	Fundamentals of Electronics	4
PHYS 280	Astronomy for Physicists	4
PHYS 310	Advanced Mechanics	3
PHYS 325	Computational Physics	3
PHYS 341	Electronics and Digital Circuits	4
PHYS 350	Modern Optics	4
PHYS 368	Fluid Mechanics	3
PHYS 377	Mathematical Physics	3
PHYS 380	Observational Astronomy	4
PHYS 399	Special Topics in Physics	1-4
PHYS 451	Radiation and Medical Physics	3
PHYS 461	General Relativity	3
PHYS 462	Nuclear Physics	4
PHYS 470	Solid State Physics	3
PHYS 480	Astrophysics	3
PHYS 495	Research or Independent Study in Physics	1-4

Graduate Swing Courses

A combined degree program allows students to complete 6-12 graduate credits ("graduate swing courses") while enrolled as an undergraduate. These courses count for both their bachelor and master's degrees. Graduate swing courses will count toward undergraduate free electives, unless noted otherwise.

The Graduate Swing Courses for this program:

Code	Title	Credits
<i>Students should discuss an appropriate course sequence with their advisors in both departments.</i>		
Complete 4 courses from the following:		12
AMAT 530	Scientific and Numerical Computing I	
AMAT 532	Applied Linear Algebra	
AMAT 534	Data-Driven Modeling and Computation	
AMAT 536	Applied Probability and Stochastic Processes	
AMAT 540	Scientific and Numerical Computing II	
AMAT 542	Methods of Applied Mathematics	
AMAT 544	Applied Differential Equations	
AMAT 546	Mathematical Biology	
AMAT 548	Nonlinear Dynamics	
AMAT 649	Independent Study	
AMAT 650	Seminar	
MATH 562	General Relativity	

Total Credits 12

General Education Requirements

Click here for a list of courses that fulfill General Education categories. (<http://catalog.montclair.edu/undergraduate-graduate-degree-requirements/general-ed-ba-bs/>)

Code	Title	Credits
A. New Student Seminar		
Complete a 1 credit New Student Seminar course.		1
C. Communication		
1. Writing		3
2. Literature		3
3. Communication		3
D. Fine and Performing Arts		
Complete a 3 credit Fine and Performing Arts course.		3
F. Humanities		
1. Great Works and Their Influences		3
2. Philosophical and Religious Perspectives		3
G. Computer Science		
CSIT 104	Python Programming I (Fulfilled in the major.)	
H. Mathematics		
Fulfilled in the major.		
AMAT 120	Applied Calculus A or MATH 122: Calculus I	
I. Natural Science Laboratory		
PHYS 191	University Physics I (Fulfilled in the major.)	
J. Physical Education		
Complete a 1 credit Physical Education course.		1
K. Social Science		
1. American and European History		3
2. Global Cultural Perspectives		3
Course selected must also satisfy the World Cultures requirement.		
3. Social Science Perspectives		3
L. Interdisciplinary Studies		
Complete a 3 credit Interdisciplinary Studies course.		3
Total Credits		32

World Languages and Cultures Requirements

Click here for a list of courses that fulfill World Languages and Cultures categories. (<http://catalog.montclair.edu/undergraduate-graduate-degree-requirements/world-languages-cultures-requirement/>)

Code	Title	Credits
World Languages		
Based on language placement exam, complete one or two sequential courses in the same language.		
World Cultures		
Requirement may be fulfilled by course selected in General Education 0-3 - Social Science: Global Cultural Perspectives.		
Total Credits		3-9

Recommended Roadmap to Degree(s)

This recommended five-year plan is provided as an outline for students to follow in order to complete their degree requirements within five years. This plan is a recommendation and students should only use it in consultation with their academic advisor.

Fifth year courses are taken at the graduate level, after matriculation into the graduate portion of this combined degree program.

Course	Title	Credits
First Year		
Fall		
GENERAL EDUCATION: (A) New Student Seminar		1
GENERAL EDUCATION: (C1) Writing		3
AMAT 120 or MATH 122	Applied Calculus A or Calculus I	4
CSIT 104	Python Programmin I	3
PHYS 191	University Physics I	4
		Credits 15
Spring		
GENERAL EDUCATION: (C2) Literature		3
GENERAL EDUCATION: (C3) Communication		3
AMAT 220 or MATH 221	Applied Calculus B or Calculus II	4
PHYS 192	University Physics II	4
PHYS 198	Introductory Physics Seminar	1
		Credits 15
Second Year		
Fall		
GENERAL EDUCATION: (K3) Social Science – Social Science Perspectives		3
CHEM 120	General Chemistry I	4
MATH 222	Calculus III	4
PHYS 210	Intermediate Mechanics	3
PHYS elective course		3-4
		Credits 17-18
Spring		
GENERAL EDUCATION: (L) Interdisciplinary Studies		3
AMAT 350 or MATH 325 or PHYS 377	Applied Mathematic: I or Ordinary Different Equation or Mathem: Physics	3-4
CHEM 121	General Chemistry II	4
PHYS 320	Statistical and Thermal Physics	3

PHYS 340	Electricity and Magnetism	3
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Credits 16-17

Third Year

Fall

World Language 1		3
PHYS 220	Oscillations, Waves, and Optics	3
PHYS 230	Intermediate Physics Laboratory	4
PHYS 300	Junior/Senior Physics Seminar	1
Free Elective		2-1

Credits 13-12

Spring

GENERAL EDUCATION: (D) Fine and Performing Arts		3
GENERAL EDUCATION: (F1) Humanities – Great Works and Their Influences		3
World Language 2		3
PHYS 360	Modern Physics	3
PHYS Elective course		3

Credits 15

Fourth Year

Fall

GENERAL EDUCATION: (J) Physical Education		1
PHYS 330	Advanced Physics Laboratory	4
PHYS 464	Quantum Mechanics	3
Applied Math Core Course 1 (Graduate swing course)		3
Applied Math Core Course 2 (Graduate swing course)		3

Credits 14

Spring

GENERAL EDUCATION: (F1) Humanities – Great Works and Their Influences		3
GENERAL EDUCATION: (K1) Social Science – American and European History		3
GENERAL EDUCATION: (K2) Social Science – Global Cultural Perspectives		3
Applied Math Core Course 3 (Graduate swing course)		3
Applied Math Elective Course (Graduate swing course)		3

Credits 15

Total Credits 120-121

Course Title Credits

Fifth Year

Fall

Applied Math Core course 4		3
Applied Math Elective course 2		3
Applied Math Elective course 3		3

Credits 9

Spring

Applied Math Elective course 4		3
Applied Math Elective course 5		3
Applied Math Culminating Experience		3

Credits 9

Total Credits 18