MONTCLAIR STATE UNIVERSITY

Montclair State University
Department of Physics and Astronomy
BS Physics/MS Applied Mathematics 5-year Combined Program

I. GenEd Requirement **32 sh**

A	New Student Seminar	1
C.	Communication	9
	C1. Writing	
	C2. Literature	
	C3. Communication	
D.	Fine and Performing Arts	3
F.	Humanities	6
	F1. Great Works and Their Influences	
	F2. Philosophical and Religious Perspectives	
G.	Computer Science *CSIT 104*	(0)
H.	Mathematics *MATH 122 or AMAT 120*	(0)
I.	Natural Science Laboratory *PHYS 191*	(0)
J.	Physical Education	1
K.	Social Science	9
	K1. American and European History	
	K2. Global Cultural Perspectives *(Select one course from attached list to also satisfy II.B. World Cultures.)*	
	K3. Social Science Perspectives	
L.	Interdisciplinary Studies	3

II. World Languages and Cultures Requirement **3-6 sh**

A. World Languages	3-6
B. World Cultures	(0)

(Some World Cultures courses may fulfill Gen Ed requirements.)

III. Major Requirements **68-70 sh**

A. Physics Core **(36 sh)**

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, & 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

B. Physics Electives **(6-7 sh)**

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 Special & General Relativity	3
PHYS 462 Nuclear Physics	4
PHYS 470 Solid State Physics	3
PHYS 480 Astrophysics	3
PHYS 495 Research/Indep. Study in Physics	1-4

C. Collateral Requirements **(26-27 sh)**

CSIT 104 Computational Concepts	3
CHEM 120 General Chemistry I	4
CHEM 121 General Chemistry II	4
MATH 122 Calc. I or AMAT 120 Applied Calc. A	4
MATH 221 Calc. II or AMAT 220 Applied Calc. B	4
MATH 222 Calculus III	4

and choose one of the following options:*

AMAT 350 Applied Mathematics I	3
or PHYS 377 Mathematical Physics	3
or MATH 325 Differential Equations	4

(= Students should consult their physics advisor regarding the relevant prerequisite course for AMAT 530, 532, and 534 when selecting their 300-level mathematics course.)*

IV. MS Applied Mathematics "Swing" Courses **12 sh**

Complete 4 courses from either the Applied Math Core (listed in VI.A. below) or the following Applied Math Electives (see VI.B below): MATH 562, AMAT 540, 542, 544, 546, 548, 649, 650. Students should discuss with their advisors in both departments on an appropriate course sequence.

(For students who do not complete the MS degree, one to two courses taken under the MS requirements will count as physics electives, and with the remaining one to two courses counting as free electives— completing the BS Physics requirements.)

V. Free Electives **0 - 5 sh**

Minimum total required for graduation **120 sh**

(additional Applied Math MS Requirements; next page)

VI. Applied Math MS Additional Requirements 18 sh

The following additional (graduate) requirements are needed to obtain the MS degree in Applied Math.

A. MS Applied Mathematics Core (0-12 sh)

Complete all courses from this list that were not previously taken as an undergraduate:

AMAT 530 Scientific and Numerical Computing* 3
AMAT 532 Applied Linear Algebra* 3
AMAT 534 Data-Driven Modeling & Computation* 3
AMAT 536 Applied Probability & Stochastic Proc. 3

B. MS Applied Mathematics Electives (15-3 sh)

Complete 5 courses from this list, including courses taken as an undergraduate: (** = recommended courses)

**MATH 562 General Relativity
**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 550 Mathematics of Investment & Risk Management
AMAT 552 Stochastic Calculus for Finance
**AMAT 649 Independent Study
AMAT 650 Seminar
CHEM 540 Advanced Physical Chemistry
CHEM 544 Chemical Thermodynamics and Electrochemistry
CSIT 574 Image Processing
CSIT 531 Robotics
CSIT 598 Machine Learning
EAES 530 Numerical Modeling of Earth Systems
EAES 575 Environmental Economics
MATH 521 Real Variables I
MATH 522 Real Variables II
MATH 525 Complex Variables I
MATH 526 Complex Variables II
STAT 532 Fundamentals of Statistics
STAT 534 Statistical Computing
STAT 536 Statistical Theory
STAT 537 Design and Analysis of Experiments
STAT 538 Regression Methods

C. MS Applied Math Culminating Experience (3 sh)

Complete one of the below:
AMAT 696 Internship
AMAT 697 Capstone
AMAT 698 Thesis
AMAT 699 Thesis Extension (if needed) (1 sh)

Graduate credits total (12 + 18): 30 sh

Revised May 21, 2020

Suggested Sequence for Five-Year Plan

First Year

Fall **Total: 15cr**	**Spring** **Total: 15cr**
I. PHYS 191 University Physics I (4) H. MATH122 Calc I or AMAT120 App Calc A(4)* G. CSIT 104 Computational Concepts (3) C1. Writing (3) A. New Student Seminar (1)	PHYS 192 University Physics II (4) PHYS 198 Introductory Physics Seminar (1) MATH 221 Calc II or AMAT 220 App Calc B (4) C2. Literature (3) C3. Communication (3)

Second Year

Fall **Total: 17-18cr**	**Spring** **Total: 16cr**
PHYS 210 Intermediate Mechanics (3)** MATH 222 Calculus III (4) CHEM 120 General Chemistry I (4) Physics Elective (3-4) K3. Social Science Perspectives (3)	PHYS 340 Electricity and Magnetism (3)** PHYS 320 Statistical and Thermal Physics (3)** AMAT 350 or PHYS 377 (3) [or MATH 325 (4)] CHEM 121 General Chemistry II (4) L. Interdisciplinary Studies (3)

Third Year

Fall **Total: 13-12cr**	**Spring** **Total: 15cr**
PHYS 220 Oscillations, Waves, & Optics (3)** PHYS 230 Intermediate Physics Lab (4) PHYS 300 Junior/Senior Physics Seminar (1) Free elective (2-1) World Language I (3)	PHYS 360 Modern Physics (3)** Physics Elective (3) D. Fine & Performing Arts (3) F1. Great Works and Their Influences (3) World Language II/Free Elective (3)

Fourth Year

Fall **Total: 14cr**	**Spring** **Total: 15cr**
PHYS 464 Quantum Mechanics (3) PHYS 330 Advanced Physics Lab (4) Applied Math Core Course 1 (3) (“swing course”) Applied Math Core Course 2 (3) (“swing course”) J. Physical Education (1)	Applied Math Elec. Course 1 (3) (“swing course”) Applied Math Core Course 3 (3) (“swing course”) F2. Philosophical & Religious Perspectives (3) K1. American & European History (3) K2.Global Cultural Perspec./World Cultures*** (3)

Fifth Year

Fall **Total: 9cr**	**Spring** **Total: 9cr**
Applied Math Core 4 (3) Applied Math Elective Course 2 (3) Applied Math Elective Course 3 (3)	Applied Math Elective Course 4 (3) Applied Math Elective Course 5 (3) Applied Math Culminating Experience (3)

Note: After Year 1, General Education, World Languages/Cultures, and free electives can be taken in any sequence.
*Students who do not have a strong (4 year) background in high school mathematics, including exponential, logarithmic, and trigonometric functions are advised to take MATH 111 Applied Precalculus before Calculus I.
** The PHYS 210, 320, 340 and PHYS 220, 360 sequences are offered in alternate years and can be taken in Year 2 or Year 3. Most 200-level and higher physics courses are offered on an alternate-year schedule.
*** GenEd Category K2 & World Cultures double-dip: ANTH 100, 115, 120, 130, 140, 150, ARAB 193, ARHT 101, DNCE 145, FREN/FRIN 283, 289, GSWS 200, HUMN 217, 289, HIST 108, 114, 132, 138, LALS 201, 205, PHIL 237, POLS 206, RELG 240, 250, 252, 254