

# Mathematics and Physics

This program is intended for students who desire additional mathematical background and preparation for graduate school or technical careers in the sciences, especially theoretical physics.

## Major Requirements

### Major: Mathematics & Physics

Degree Type: B.A. or B.S.

Minimum Degree Credits to Graduate: 122

### General Education Requirements for Baccalaureate Degree

- A list of approved general education courses is available here (<http://bulletin.ndsu.edu/past-bulletin-archive/2017-18/academic-policies/undergraduate-policies/general-education/#genedcoursestext>).
- General education courses may be used to satisfy requirements for both general education and the major, minor, and program emphases, where applicable. Students should carefully review the major, minor, and program emphases requirements for minimum grade restrictions, should they apply.

Code	Title	Credits
<b>Communication (C)</b>		<b>12</b>
ENGL 110	College Composition I	
ENGL 120	College Composition II	
COMM 110	Fundamentals of Public Speaking	
Upper Division Writing <sup>†</sup>		
<b>Quantitative Reasoning (R) <sup>†</sup></b>		<b>3</b>
<b>Science and Technology (S) <sup>†</sup></b>		<b>10</b>
<b>Humanities and Fine Arts (A) <sup>†</sup></b>		<b>6</b>
<b>Social and Behavioral Sciences (B) <sup>†</sup></b>		<b>6</b>
<b>Wellness (W) <sup>†</sup></b>		<b>2</b>
<b>Cultural Diversity (D) <sup>**†</sup></b>		
<b>Global Perspectives (G) <sup>**†</sup></b>		
Total Credits		39

\* May be satisfied by completing courses in another General Education category.

† May be satisfied with courses required in the major. Review major requirements to determine if a specific upper division writing course is required.

## College Requirements

Code	Title	Credits
<b>Bachelor of Arts (BA) Degree – An additional 12 credits Humanities and Social Sciences and proficiency at the second year level in a modern foreign language. *</b>		<b>12</b>
<b>Bachelor of Science (BS) Degree – An additional 6 credits in Humanities or Social Sciences *</b>		<b>6</b>

\* Humanities and Social Sciences may be fulfilled by any course having the following prefix: ADHM, ANTH, ARCH, ART, CJ, CLAS, COMM, ECON, ENGL, FREN, GEOG, GERM, HDFS, HIST, LA, LANG, MUSC, PHIL, POLS, PSYC, RELS, SOC, SPAN, THEA, WGS, or any course from the approved list of general education courses in humanities and social sciences (general education categories A and B). These credits must come from outside the department of the student's major.

## Major Requirements

A grade of 'C' or better is required for all MATH, PHYS, and AST prefix courses.

Code	Title	Credits
<b>Mathematics Major Requirements</b>		
MATH 129	Basic Linear Algebra	3
MATH 165	Calculus I (May satisfy general education category R)	4
MATH 166	Calculus II	4

MATH 265	Calculus III	4
MATH 266	Introduction to Differential Equations	3
MATH 270	Introduction to Abstract Mathematics	3
MATH 329	Intermediate Linear Algebra	3
MATH 346	Metric Space Topology	3
Select any two of the following:		6
MATH 420	Abstract Algebra I	
MATH 450	Real Analysis I	
MATH 452	Complex Analysis	
MATH 483	Partial Differential Equations	
MATH 491	Seminar	2
<b>Physics Major Requirements</b>		
PHYS 171	Introductory Projects in Physics	1
PHYS 251 & 251L	University Physics I and University Physics I Laboratory (May satisfy general education category S)	5
PHYS 251R	University Physics I Recitation	1
PHYS 252 & 252L	University Physics II and University Physics II Laboratory (May satisfy general education category S)	5
PHYS 252R	University Physics II Recitation	1
PHYS 350	Modern Physics	3
PHYS 355	Classical Mechanics (or PHY 330: Intermediate Mechanics at MSUM)	3
PHYS 360	Modern Physics II	3
PHYS 361	Electromagnetic Theory (or PHY 370: Electromagnetic Theory at MSUM)	3
PHYS 370	Introduction to Computational Physics	3
PHYS 462	Thermal and Statistical Physics	3
PHYS 485	Quantum Mechanics I	3
PHYS 486	Quantum Mechanics II	3
PHYS 489	Senior Project II	3
Physics Electives: Select 3 of the following:		9
PHYS 215	Research For Undergraduates	
PHYS 411	Optics for Scientists & Engineers	
PHYS 413	Lasers for Scientists and Engineers	
PHYS 415	Elements of Photonics	
PHYS 481	Condensed Matter Physics	
MSUM AST	Astronomy courses (300/400-level) with departmental permission	
<b>Related Required Courses</b>		
Computer Science:		
CSCI 160	Computer Science I	4
Chemistry: Select one of the following (150/160 recommended):		4
CHEM 150 & CHEM 160	Principles of Chemistry I and Principles of Chemistry Laboratory I	
CHEM 121 & 121L	General Chemistry I and General Chemistry I Laboratory	
Select one of the following (151/161 recommended):		4
CHEM 151 & CHEM 161	Principles of Chemistry II and Principles of Chemistry Laboratory II	
CHEM 122 & 122L	General Chemistry II and General Chemistry II Laboratory	
Total Credits		96

## Program Notes

- Except for courses offered only as pass/fail grading, no course may be taken Pass/Fail.

<b>Freshman</b>			
<b>Fall</b>	<b>Credits</b>	<b>Spring</b>	<b>Credits</b>
PHYS 171	1	PHYS 251	4
MATH 165	4	PHYS 251L	1
CHEM 150	3	PHYS 251R	1
CHEM 160	1	MATH 166	4
ENGL 110 <sup>credit automatically granted if you earn a "C" in ENGL 120</sup>	4	COMM 110	3
ENGL 120 <sup>can enroll in ENGL 120 if ACT score &gt; 17</sup>	3	CHEM 151	3
MATH 129	3	CHEM 161	1
	19		17
<b>Sophomore</b>			
<b>Fall</b>	<b>Credits</b>	<b>Spring</b>	<b>Credits</b>
PHYS 252	4	PHYS 350	3
PHYS 252L	1	MATH 266	3
PHYS 252R	1	CSCI 160	4
MATH 265	4	Social/Behavioral Science Elective	3
MATH 270	3	Wellness Elective	2
Humanities/Fine Arts Elective	3	MATH 329	3
	16		18
<b>Junior</b>			
<b>Fall</b>	<b>Credits</b>	<b>Spring</b>	<b>Credits</b>
PHYS 360	3	PHYS 361	3
MATH 420	3	PHYS 370	3
PHYS 355	3	ENGL 324	3
MATH 450	3	Social/Behavioral Science Elective	3
Social/Behavioral Science Elective	3	MATH 452	3
Humanities/Fine Arts Elective	3	or MATH 483 Partial Differential Equations	3
		MATH 346	3
	18		18
<b>Senior</b>			
<b>Fall</b>	<b>Credits</b>	<b>Spring</b>	<b>Credits</b>
PHYS 462	3	PHYS 486	3
PHYS 485	3	PHYS 489	2
Physics Elective	3	Physics Elective	3
MATH 4XX Math Elective	3	MATH 491	2
PHYS 488	1	Humanities/Fine Arts Elective	3
	13		13

Total Credits: 132