

# Physics and Computer Science

Since the dawn of the computer age, Computer Science and Physics have been closely intertwined disciplines. Computational physics is now an established branch of physics, complementing experiment and theory, that develops and applies computer modeling approaches to the solution of a wide range of physical problems. At the same time, software development (e.g., for graphics and data mining applications) is increasingly inspired by physics. Computer modeling, including simulation and numerical analysis, is an essential component of modern research and development. Correspondingly, the demand is growing for scientists with multidisciplinary training that combines fundamental knowledge of physics and computer science with practical skills in programming and computation. The Computer Science and Physics double major program is designed to allow students to complete the core requirements of both majors in a four-year degree. Graduates of the program will have a unique background qualifying them to work in industry or to pursue graduate studies in physics, computer science, engineering, or other technical fields.

## Major Requirements

### Major: Physics & Computer Science

**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		<b>39</b>

\* 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 CSCI, PHYS, and AST prefix courses.

Code	Title	Credits
<b>Computer Science Major Requirements</b>		
CSCI 160	Computer Science I	4
CSCI 161	Computer Science II	4
CSCI 189	Skills for Academic Success <sup>1</sup>	1
CSCI 213	Modern Software Development	3
CSCI 336	Theoretical Computer Science	3
CSCI 366	Database Systems	3
CSCI 372	Comparative Programming Languages	3
CSCI 374	Computer Organization and Architecture	3
CSCI 467	Algorithm Analysis	3
CSCI 474	Operating Systems Concepts	3
CSCI Electives	CSCI 313 and/or any 400-level CSCI course that is not already used.	6
<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 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 355	Classical Mechanics (or PHY 330: Intermediate Mechanics at MSUM)	3
PHYS 462	Thermal and Statistical Physics	3
PHYS 485	Quantum Mechanics I	3
PHYS 486	Quantum Mechanics II	3
Physics Electives: Select from the following:		6
PHYS 215	Research For Undergraduates	
PHYS 411	Optics for Scientists & Engineers	
PHYS 413	Lasers for Scientists and Engineers	
PHYS 415	Elements of Photonics	
PHYS 463	Statistical Mechanics	
PHYS 481	Condensed Matter Physics	
PHYS 489	Senior Project II (If not used to satisfy project requirement)	
MSUM AST	Astronomy courses (300/400-level) with departmental permission	
<b>Related Required Courses</b>		
MATH 129 or MATH 429	Basic Linear Algebra 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
CSCI 445 or PHYS 489	Software Projects Capstone Senior Project II	3
Total Credits		103

<sup>1</sup> CSCI 189 is only required for first-time, first-year students—A first-time, first-year student is defined as a student who has not yet completed a college course as a college student. Students that are not first-time, first-year students that either transfer into the university or change their major are not required to take CSCI 189.

## 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
CSCI 160	4	PHYS 251R	1
CSCI 189	1	MATH 129	3
ENGL 110 <sup>credit automatically granted if you earn a "C" in ENGL 120</sup>	4	MATH 166	4
ENGL 120 <sup>can enroll in ENGL 120 if ACT score &gt; 17</sup>	3	CSCI 161	4
Wellness Elective	2		
	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	COMM 110	3
MATH 265	4	CSCI 336	3
CSCI 213	3	Humanities/Fine Arts Elective	3
MATH 270	3	Social/Behavioral Science Elective	3
	16		18
<b>Junior</b>			
<b>Fall</b>	<b>Credits</b>	<b>Spring</b>	<b>Credits</b>
PHYS 360	3	PHYS 370	3
CSCI 366	3	ENGL 324	3
PHYS 355	3	PHYS 361	3
Humanities/Fine Arts Elective	3	CSCI 372	3
		CSCI 374	3
	12		15
<b>Senior</b>			
<b>Fall</b>	<b>Credits</b>	<b>Spring</b>	<b>Credits</b>
PHYS 361	3	PHYS 489	2
PHYS 462	3	CSCI 467	3
Physics Elective	3	PHYS 486	3
CSCI 474	3	CSCI 313	3
CSCI 4XX Computer Science Elective	3	or CSCI 4XX Computer Science Elective	
Social/Behavioral Science Elective	3	Humanities/Fine Arts Elective	3
PHYS 485	3	Social/Behavioral Science Elective	3

PHYS 488	1	
	22	17

Total Credits: 136