COMPUTER SCIENCE + PHYSICS, BS

Physics focuses on quantitative descriptions for the behavior of physical systems. Computer science has a natural place in the study of physics. Computer science enables much more advanced computation than that available using pen and paper. These computational advances dramatically increase the complexity of physical systems that can be described quantitatively.

The Illinois CS+Physics program blends our physics and computer science degrees to give students the skills to both understand and carry out quantitative models of physical systems. This collaboration between Computer Science and Physics provides an innovative program for students who are interested in the intersection between computing and physics.

Students in the CS + Physics program will develop mastery in areas ranging from numerical methods and machine learning to algorithms for computational science and quantum computing. The program combines the domain expertise in Physics, including its computational aspects, with the broad-based expertise in computing from Computer Science. This unique approach allows students to bridge these two areas.

Students enrolled in CS+Physics have ample opportunity to explore both their interests in Physics and Computer Science through the selection of technical electives. In consultation with the academic advisor, each student will elect a set of technical courses broadening their knowledge of both Physics and Computer Science. Technical electives add a minimum of seventeen (17) hours to the core Physics and Computer Science combined curriculum.

The top-10 rated Physics and Computer Science programs provide students the unique opportunity to receive instruction from the top scientists in both subjects.

for the degree of Bachelor of Science in Computer Science plus Physics

Graduation Requirements

Minimum Technical GPA (http://catalog.illinois.edu/undergraduate/engineering/computer-science-physics-bs/go.grainger.illinois.edu/TechnicalGPA/): 2.0.
TGPA is required for CS, Math, and Physics courses. See Technical GPA (https://go.grainger.illinois.edu/TechnicalGPA/) to clarify requirements.
Minimum Overall GPA: 2.0
Minimum hours required for graduation: 128 hours
General education: Students must complete the Campus General Education (https://courses.illinois.edu/) requirements including the campus general education language requirement.

Orientation and Professional Development

Code	Title	Hours
ENG 100	Grainger Engineering Orientation Seminar (External transfer students take ENG 300.)	1
PHYS 110	Physics Careers	0
	Highly recommended, optional 1 credit hour course, CS 100 Computer Science Orientation. Credit hour counts toward free electives.	
Total Hours		**1**

Foundational Mathematics and Science

Code	Title	Hours
MATH 221	Calculus I (MATH 220 may be substituted. MATH 220 is appropriate for students with no background in calculus. 4 of 5 credit hours count towards degree.)	4
MATH 231	Calculus II	3
MATH 241	Calculus III	4
MATH 257	Linear Algebra with Computational Applications	3-4
or MATH 416	Abstract Linear Algebra	
MATH 285	Intro Differential Equations	3
PHYS 211	University Physics: Mechanics	4
PHYS 212	University Physics: Elec & Mag	4
PHYS 213	Univ Physics: Thermal Physics	2
PHYS 214	Univ Physics: Quantum Physics	2
CS 361	Probability & Statistics for Computer Science	3-4
or STAT 400	Statistics and Probability I	
Total Hours		**32-34**

Computer Science Core

Code	Title	Hours
CS 124	Introduction to Computer Science I	3
CS 128	Introduction to Computer Science II	3
CS 173	Discrete Structures	3
CS 222	Software Design Lab	1
CS 225	Data Structures	4
Choose one of the following options:		8-9
CS 233 & CS 341	Computer Architecture and System Programming	
OR		
CS 340	Introduction to Computer Systems	
& Two CS 400-level courses	Any two (2) 400-level CS courses above CS 403, excluding CS 491 and distinct from any 400-level courses taken to satisfy other requirements. If either or both of the courses are chosen for 4 credits, the extra credit hours will count towards free electives.	
CS 374	Introduction to Algorithms & Models of Computation	4
CS 357	Numerical Methods I	3
or CS 450	Numerical Analysis	
CS Technical Elective	Any 400-level CS course above CS 403, excluding CS 491, and distinct from any 400-level courses taken to satisfy other requirements.	3
Total Hours		**32-33**

Physics Core

Code	Title	Hours
PHYS 225	Relativity & Math Applications	2
PHYS 246	Physics on the Silicon Prairie: An Introduction to Modern Computational Physics	2
PHYS 325	Classical Mechanics I	3
PHYS 435	Electromagnetic Fields I	3
PHYS 486	Quantum Physics I	3-4
or PHYS 485	Atomic Phys & Quantum Theory	
PHYS 446	Modern Computational Physics	3
PHYS technical elective: Choose from CS or PHYS 300- or 400-level courses		14
Total Hours		**30-31**

Free Electives

Code	Title	Hours
Additional coursework, subject to the Grainger College of Engineering restrictions to Free Electives, so that there are at least 128 credit hours earned toward the degree. (https://go.grainger.illinois.edu/FreeElectives/)		13 - 17
Total Minimum Hours of Curriculum to Graduate		**128**

for the degree of Bachelor of Science in Computer Science plus Physics

Sample Sequence

This sample sequence is intended to be used only as a guide for degree completion. All students should work individually with their academic advisors to decide the actual course selection and sequence that works best for them based on their academic preparation and goals. Enrichment programming such as study abroad, minors, internships, and so on may impact the structure of this four-year plan. Course availability is not guaranteed during the semester indicated in the sample sequence.

Students must fulfill their Language Other Than English requirement by successfully completing a third level of a language other than English. For more information see the corresponding section on the Degree and General Education Requirements page *(*http://catalog.illinois.edu/general-information/degree-general-education-requirements/*).*

Free Electives: Additional course work, subject to the Grainger College of Engineering restrictions to Free Electives, so that there are at least 128 credit hours earned toward the degree.

First Year

First Semester	Hours	Second Semester	Hours
MATH 221 (MATH 220 may be substituted)	4	MATH 231	3
PHYS 110	0	PHYS 211	4
ENG 100 (External transfer students take ENG 300.)	1	CS 128	3
CS 124	3	CS 173	3
Composition I or General Education (Choose a Humanities or Social/Behavioral Science course)	4-3	General Education (Choose a Humanities or Social/Behavioral Science course) or Composition I	3-4
General Education course (choose a Humanities or Social/Behavioral Science course with Cultural Studies designation)	3		
	15		**16**

Second Year

First Semester	Hours	Second Semester	Hours
MATH 241	4	MATH 285	3
PHYS 212	4	PHYS 213	2
PHYS 225	2	PHYS 214	2
CS 225	4	PHYS 246	2
General Education course (choose a Humanities or Social/Behavioral Science course with Cultural Studies designation)	3	CS 233 or 340	4-3
		CS 222	1
		General Education course (choose a Humanities or Social/Behavioral Science course with Cultural Studies designation)	3
	17		**17**

Third Year

First Semester	Hours	Second Semester	Hours
MATH 257 (MATH 416 may be substituted.)	3	CS 357 (or CS 450)	3
PHYS 325	3	PHYS 435	3
CS 361 (STAT 400 may be substituted)	3	CS Technical Elective course	3
PHYS Technical Elective course	3	PHYS Technical Elective course	3

General Education (Advanced Composition) course	3	Language Other Than English (3rd level) course	4
	15		**16**

Fourth Year

First Semester	Hours	Second Semester	Hours
PHYS 485 (PHYS 486 may be substituted)	3	PHYS 446	3
CS 374	4	PHYS Technical Elective course	4
Free elective course	3	PHYS Technical Elective course	4
Free elective course	3	CS 341 (or CS Technical Elective course)	4
Free elective course	3	Free elective course	2
	16		**16**

Total Hours 128

for the degree of Bachelor of Science in Computer Science plus Physics

The Department of Physics Undergraduate Studies Office—together with guidance from the Physics Undergraduate Studies Committee—will work to collect, compile, evaluate, and report on the learning outcomes for its courses. This work will include, but not be limited to:

1. Informal Early Feedback:
   Students in each major-specific course will be invited to participate in a survey to help the department and instructors evaluate the students' understanding of the course learning objectives, outcomes, and course goals. Summary reports will be made available to instructors and the department leadership.
2. Evaluation of Direct Student Learning and Other Summative Learning Assessments:
   Final examinations (i.e., questions and student work) will be collected for evaluation of learning outcomes. This will include evaluation of the assessments' usefulness in evaluation of learning outcomes, as well as the mastery of the outcomes by students. Anonymized student work will be used for the evaluation. Summary reports will be made available to instructors and the Department leadership. Additionally, CS will follow its standard student outcomes assessment process for the core CS courses, in the same manner as it uses for continuous assessment of the CS BS program.
3. Indirect Evaluation of Student Learning:
   Indirect measures of student learning will include current enrollment, including demographic information.
4. Degree completion rates, including information regarding:
   - Semesters to completion
   - Degree program requirements
   - Semesters to complete specified intra-degree program requirements
   - Choke-points in degree completion progression
   - Course updates and revisions
   - Desirable new courses
   - Demographic trends

for the degree of Bachelor of Science in Computer Science plus Physics

Physics website
Physics faculty **(**https://physics.illinois.edu/people/directory/**)**

The Grainger College of Engineering Admissions **(**https://grainger.illinois.edu/admissions/**)**
The Grainger College of Engineering