

Department of Computer Science

(College of Humanities, Arts and Sciences)

www.cs.uni.edu/

The Department of Computer Science offers the following programs:

Undergraduate Majors (B.S.)

- Computer Science (p. 1)
- Cybersecurity and System Administration (p. 2)

Undergraduate Major (B.A.)

- Computer Science (p. 2)

Minor

- Computer Science (p. 3)
- Data Science (p. 3) (also listed in Department of Mathematics and Department of Physics)

Program Certificates

- Computer Science (p. 4)
- Computer Science Education (p. 4)

Notes:

1. Undergraduate students who have been admitted to the university provisionally because of non-satisfaction of the high school mathematics requirements may not enroll in any computer science credit course before this requirement has been met.
2. All courses counting toward a major or minor in the Department of Computer Science must be passed with a grade of C- or better.
3. Prerequisite courses in the Department of Computer Science must be passed with a grade of C before taking a subsequent course.
4. All majors in the Department of Computer Science require a project course (marked with asterisk in the degree statements). The course used to meet this requirement is to be taken in the area of specialization, i.e., an area in which at least three courses are taken.
5. All courses in a prerequisite chain to a course are considered regressive to it - students may not take them for credit after passing the later course. Additionally, CS 1120, CS 1130, CS 1160, CS 1170, CS ED 1310, and CS ED 1320 are regressive to CS 1520 and any course having it as prerequisite.
6. A student with a major in the Department of Computer Science cannot also receive a Computer Science minor.
7. A student with a major in the Department of Computer Science cannot also receive a Certificate in Computer Science.
8. A student with a minor in the Department of Computer Science cannot also receive a Certificate in Computer Science.

Bachelor of Science Degree Programs

Computer Science Major

The B.S. Computer Science major requires a minimum of 120 total hours to graduate. This total includes UNIFI/General Education requirements and the following specified major requirements, plus electives to complete the minimum of 120 hours.

Required

Computer Science:		
CS 1410	Computer Organization	3
CS 1510	Introduction to Computing	4
CS 1520	Data Structures	4
CS 1800	Discrete Structures	3
CS 2530	Intermediate Computing	3
CS 3730/5730	Project Management	1
Research:		
CS 4800	Undergraduate Research in Computer Science (topic pre-approved by department)	1

Electives

Mathematics:		
Select four from the following:		13
MATH 1420	Calculus I ^{^,#}	
MATH 1421	Calculus II [#]	
MATH 2500	Linear Algebra for Applications	
MATH 3440/5440	Numerical Analysis	
MATH 3530/5530	Combinatorics	
MATH 3752/5752	Introduction to Probability	
STAT 1772	Introduction to Statistical Methods	
Computer Science:		24
Eight courses including:		
A specialty of three courses from the Foundations area		
A specialty of three courses from one other area		
One course from each of the remaining two areas		
One of the specialty areas must include a project course (marked with an asterisk *)		
Foundations:		
CS 3530	Design and Analysis of Algorithms	
CS 3540	Programming Languages and Paradigms	
CS 3810/5810	Theory of Computation	
CS 4550/5550	Translation of Programming Languages [*]	
CS 4880/5880	Topics in Computer Science [†]	
Data and Applications:		

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CS 3140/5140	Database Systems	
CS 3150/5150	Information Storage and Retrieval	
CS 3610/5610	Artificial Intelligence [#]	
CS 3650/5650	Computational Biology	
CS 4620/5620	Intelligent Systems [*]	
CS 4880/5880	Topics in Computer Science [†]	
Software Engineering:		
CS 2720	Software Engineering	
CS 3120/5120	User Interface Design	
CS 3750/5750	Software Verification and Validation	
CS 4740/5740	Real-Time Embedded Systems ^{*,#}	
CS 4880/5880	Topics in Computer Science [†]	
Systems:		
CS 2420	Computer Architecture and Parallel Programming	
CS 3430/5430	Operating Systems	
CS 3470/5470	Networking	
CS 4400/5400	System Administration	
CS 4410/5410	System Security [*]	
CS 4420	Applied Systems Forensics [*]	
CS 4880/5880	Topics in Computer Science [†]	
Electives:		6
Two courses selected from among the Computer Science "area" courses and 2000-level or above courses meeting the Mathematics requirements.		
Total Hours		62

[^] MATH 1420 has prerequisite of MATH 1140, or MATH 1110 and MATH 1130, or equivalent.

^{*} A project course must be taken as one of the three in the specialty area.

[#] MATH 1420, MATH 1421, and CS 4740/5740 are 4-hour courses. CS 3610/5610 is a 4-hour course if taken with lab.

[†] CS 4880/5880 may be counted in a specialty area with department approval for the specific topic.

Cybersecurity and System Administration Major

The B.S. Cybersecurity and System Administration major requires a minimum of 120 total hours to graduate. This total includes UNIFI/General Education requirements and the following specified major requirements, plus electives to complete the minimum of 120 hours.

Required

Mathematics:		
MATH 1420	Calculus I [^]	4
MATH 1421	Calculus II	4
Computer Science:		
CS 1410	Computer Organization	3
CS 1510	Introduction to Computing	4
CS 1520	Data Structures	4
CS 1800	Discrete Structures	3

CS 3430/5430	Operating Systems	3
CS 3470/5470	Networking	3
CS 3730/5730	Project Management	1
CS 4400/5400	System Administration	3
CS 4410/5410	System Security	3
CS 4420	Applied Systems Forensics	3
CS 4800	Undergraduate Research in Computer Science (1 hr.))	1

Physics:

PHYSICS 4300/5300	Introduction to Electronics	4
Choose ONE of the following sequences:		8

PHYSICS 1511	General Physics I	
PHYSICS 1512	General Physics II	
OR		
PHYSICS 1701	Physics I for Science and Engineering	
PHYSICS 1702	Physics II for Science and Engineering	

Electives **6**

Computer Science:		
from courses numbered 2420 or above, excluding CS 2880, CS 3110, and CS 3510 [*]		
Technology:		
TECH 1037	Introduction to Circuits	
TECH 1039	Circuits and Systems	
TECH 2051	Analog Electronics	
TECH 2053	Digital Electronics	
TECH 4103/5103	Electronic Communications	
TECH 4104/5104	Applied Digital Signal Processing	

Total Hours **57**

[^] Has prerequisite of satisfactory score on ALEKS exam or subsequent remediation.

Bachelor of Arts Degree Programs

Computer Science Major

The B.A. Computer Science major requires a minimum of 120 total hours to graduate. This total includes UNIFI/General Education requirements and the following specified major requirements, plus electives to complete the minimum of 120 hours.

Required

Computer Science:		
CS 1410	Computer Organization	3
CS 1510	Introduction to Computing	4
CS 1520	Data Structures	4
CS 1800	Discrete Structures	3
CS 2530	Intermediate Computing	3
CS 3730/5730	Project Management	1

Electives

Mathematics:		
Select two of the following:		6

MATH 1420	Calculus I ^{^,#}
MATH 1421	Calculus II [#]
MATH 2500	Linear Algebra for Applications
MATH 3440/5440	Numerical Analysis
MATH 3530/5530	Combinatorics
MATH 3752/5752	Introduction to Probability
STAT 1772	Introduction to Statistical Methods
Computer Science: 18	
Six courses including:	
Three courses from one specialty area	
One course from each of the remaining three areas	
Specialty area must include a project course (*)	
Foundations:	
CS 3530	Design and Analysis of Algorithms
CS 3540	Programming Languages and Paradigms
CS 3810/5810	Theory of Computation
CS 4550/5550	Translation of Programming Languages [*]
CS 4880/5880	Topics in Computer Science [†]
Data and Applications:	
CS 3140/5140	Database Systems
CS 3150/5150	Information Storage and Retrieval
CS 3610/5610	Artificial Intelligence [#]
CS 3650/5650	Computational Biology
CS 4620/5620	Intelligent Systems [*]
CS 4880/5880	Topics in Computer Science [†]
Software Engineering:	
CS 2720	Software Engineering
CS 3120/5120	User Interface Design
CS 3750/5750	Software Verification and Validation
CS 4740/5740	Real-Time Embedded Systems ^{*,#}
CS 4880/5880	Topics in Computer Science [†]
Systems:	
CS 2420	Computer Architecture and Parallel Programming
CS 3430/5430	Operating Systems
CS 3470/5470	Networking
CS 4400/5400	System Administration
CS 4410/5410	System Security [*]
CS 4420	Applied Systems Forensics [*]
CS 4880/5880	Topics in Computer Science [†]
Electives	3
One course selected from among the Computer Science "area" courses and 2000-level or above courses meeting the Mathematics requirement.	
Total Hours	45

[^] MATH 1420 has prerequisite of MATH 1140, or MATH 1110 and MATH 1130, or equivalent.

^{*} A project course must be taken as one of the three in the specialty area.

[#] MATH 1420, MATH 1421, and CS 4740/5740 are 4-hour courses. CS 3610/5610 is a 4-hour course if taken with lab.

[†] CS 4880 may be counted in a specialty area with department approval for the specific topic.

Minors

Computer Science Minor

A student with a major in the Department of Computer Science cannot also receive a Computer Science minor.

Required

Computer Science:		
CS 1410	Computer Organization	3
CS 1510	Introduction to Computing	4
CS 1520	Data Structures	4
CS 1800	Discrete Structures	3
CS 2530	Intermediate Computing	3

Electives

any Computer Science course that counts toward the Computer Science B.A. major	9
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Total Hours **26**

Data Science Minor

The Data Science minor is an interdisciplinary program that integrates computer programming, machine learning, statistics, predictive modeling and visualization to provide students with broad based skills for extracting gainful information from data that originate from a variety of sources. A final project (ideally with corporate or non-profit partnerships) will ensure that students employ their skills to solve a real-world problem.

Statistics:

STAT 1772	Introduction to Statistical Methods	3
STAT 4784/5784	Introduction to Machine Learning	3

Computer Science:

CS 1510	Introduction to Computing	4
CS 2150	Computing for Data Science	3-7
or		
CS 1520 & CS 1800	Data Structures and Discrete Structures	
CS 3140/5140	Database Systems	3

Physics:

PHYSICS 4160/5160	Data Visualization, Modeling and Simulation	3
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Required Data Science Project **2-3**

CS 4800	Undergraduate Research in Computer Science	
or MATH 4990	Undergraduate Research in Mathematics	

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or PHYSICS 3000 Undergraduate Research in Physics

Total Hours 21-26

Program Certificates

The University of Northern Iowa makes available, in addition to traditional programs, the opportunity for students to earn program certificates. Program certificates provide an alternative to programs leading to a degree, a major, or a minor; they certify that an individual has completed a program approved by the university. For information on the following certificates, contact the Department of Computer Science or the Office of the Registrar, which serves as the centralized registry.

Certificate in Computer Science

A student with a major in the Department of Computer Science cannot also receive a Certificate in Computer Science.

Required

Computer Science:		
CS 1520	Data Structures	4
one course from the following:		3-4
CS 1120	Media Computation	
CS 1130	Visual BASIC Programming	
CS 1160	C/C++ Programming	
CS ED 1310	Programming Environments for Elementary Education	
CS ED 1320	Fundamentals of Programming	
CS 1510	Introduction to Computing	
Two courses, from ONE of the following groups:		6
Group 1:		
CS 1800	Discrete Structures	
CS 2530	Intermediate Computing	
or Group 2:		
CS 1410	Computer Organization	
CS 2420	Computer Architecture and Parallel Programming	
Total Hours		13-14

Certificate in Computer Science Education

This Computer Science Education certificate is appropriate for students interested in adding experience in computer science to a teaching license. It is for students with a teaching major in a discipline outside of computer science. It consists of the coursework approved by the Iowa Board of Educational Examiners to qualify for the addition of the state's 5-12 Computer Science endorsement #278 on a state teaching license.

Required:

CS ED 1320	Fundamentals of Programming	3
CS ED 2310	Foundational Concepts in Computer Science	3
CS ED 3310/5310	Teaching and Learning Programming	3
CS ED 3320/5320	Data Structures and Algorithms	3

CS ED 4330/5330	Methods for Teaching Computer Science	3
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Total Hours 15

Computer Science, B.S.

Goal 1: Students will be able to effectively communicate computing information to colleagues and the public.

Outcome 1: Students will be able to prepare and produce written communications using standard computing style and format.

Outcome 2: Students will be able to prepare and deliver an oral presentation on computing topics.

Goal 2: Students will be able to apply computing knowledge to problems involving data and process.

Outcome 3: Students will demonstrate proficient knowledge and application of computing content.

Goal 3: Students will be able to think critically about computing problems.

Outcome 4: Students will be able to specify a computing module's interface and design its implementation.

Outcome 5: Students will be conduct a research or development project in which they specify a computing problem, investigate possible solutions, and implement a working system.

Goal 4: Students will demonstrate the skills needed to work on a team successfully.

Outcome 6: Students will work on a team to analyze a computing problem and implement its solution.

Cybersecurity and System Administration, B.S.

Goal 1: Students will be able to effectively communicate networking and computer system information to colleagues and the public.

Outcome 1: Students will be able to prepare and produce written communications using standard computing style and format.

Outcome 2: Students will be able to prepare and deliver an oral presentation on networking and computer system topics.

Goal 2: Students will be able to apply networking and computer system knowledge to problems involving data and process.

Outcome 3: Students will demonstrate proficient knowledge and application of networking and computer system content.

Goal 3: Students will be able to think critically about networking and computer system problems.

Outcome 4: Students will be able to specify a computing systems's interface and design its implementation.

Outcome 5: Students will be conduct a research or development project in which they specify a networking or computer system problem, investigate possible solutions, and implement a working system.

Goal 4: Students will demonstrate the skills needed to work on a team successfully.

Outcome 6: Students will work on a team to analyze a networking or computer system problem and implement its solution.

Computer Science, B.A.

Goal 1: Students will be able to effectively communicate computing information to colleagues and the public.

Outcome 1: Students will be able to prepare and produce written communications using standard computing style and format.

Outcome 2: Students will be able to prepare and deliver an oral presentation on computing topics.

Goal 2: Students will be able to apply computing knowledge to problems involving data and process.

Outcome 3: Students will demonstrate proficient knowledge and application of computing content.

Goal 3: Students will be able to think critically about computing problems.

Outcome 4: Students will be able to specify a computing module's interface and design its implementation.

Goal 4: Students will demonstrate the skills needed to work on a team successfully.

Outcome 5: Students will work on a team to analyze a computing problem and implement its solution.