Department of Computer Science

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:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 1410</td>
<td>Computer Organization</td>
<td>3</td>
</tr>
<tr>
<td>CS 1510</td>
<td>Introduction to Computing</td>
<td>4</td>
</tr>
<tr>
<td>CS 1520</td>
<td>Data Structures</td>
<td>4</td>
</tr>
<tr>
<td>CS 1800</td>
<td>Discrete Structures</td>
<td>3</td>
</tr>
<tr>
<td>CS 2530</td>
<td>Intermediate Computing</td>
<td>3</td>
</tr>
<tr>
<td>CS 3730/5730</td>
<td>Project Management</td>
<td>1</td>
</tr>
</tbody>
</table>

Research:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 4800</td>
<td>Undergraduate Research in Computer Science (topic pre-approved by department)</td>
<td>1</td>
</tr>
</tbody>
</table>

Electives

Mathematics:

Select four from the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 1420</td>
<td>Calculus I &quot;^&quot;</td>
<td></td>
</tr>
<tr>
<td>MATH 1421</td>
<td>Calculus II &quot;#&quot;</td>
<td></td>
</tr>
<tr>
<td>MATH 2500</td>
<td>Linear Algebra for Applications</td>
<td></td>
</tr>
<tr>
<td>MATH 3440/5440</td>
<td>Numerical Analysis</td>
<td></td>
</tr>
<tr>
<td>MATH 3530/5530</td>
<td>Combinatorics</td>
<td></td>
</tr>
<tr>
<td>MATH 3752/5752</td>
<td>Introduction to Probability</td>
<td></td>
</tr>
<tr>
<td>STAT 1772</td>
<td>Introduction to Statistical Methods</td>
<td></td>
</tr>
</tbody>
</table>

Computer Science:

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:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 3530</td>
<td>Design and Analysis of Algorithms</td>
<td></td>
</tr>
<tr>
<td>CS 3540</td>
<td>Programming Languages and Paradigms</td>
<td></td>
</tr>
<tr>
<td>CS 3810/5810</td>
<td>Theory of Computation</td>
<td></td>
</tr>
<tr>
<td>CS 4550/5550</td>
<td>Translation of Programming Languages</td>
<td></td>
</tr>
<tr>
<td>CS 4880/5880</td>
<td>Topics in Computer Science</td>
<td></td>
</tr>
</tbody>
</table>

Data and Applications:
Department of Computer Science

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 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

Total Hours 62

^ 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 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 has prerequisite of satisfactory score on ALEKS exam or subsequent remediation.
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

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 Data Structures
& CS 1800 Discrete Structures
CS 3140/5140 Database Systems 3

Physics:
PHYSICS 4160/5160 Data Visualization, Modeling and Simulation 3

Required Data Science Project 2-3

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

Total Hours 45
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

Total Hours 15