The Department of Computer Science offers the following undergraduate and program certificates. Specific requirements for these programs are listed within this Department of Computer Science section in the following order:

**Undergraduate Majors (B.S.)**
- Computer Science (p. 1)
- Networking 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 an 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 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.

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**Bachelor of Science Degree Programs**

**Computer Science Major**

The B.S. Computer Science major requires a minimum of 126 total hours to graduate. This total includes UNIFI/General Education requirements and the following specified major requirements, plus electives to complete the minimum of 126 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:**
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 4400/5400 System Administration *
CS 4410/5410 System Security *
CS 4420 Applied Systems Forensics *
CS 4880/5880 Topics in Computer Science †

Electives:
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.
# 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.

Networking and System Administration Major
The B.S. Networking and System Administration major requires a minimum of 126 total hours to graduate. This total includes UNIFI/General Education requirements and the following specified major requirements, plus electives to complete the minimum of 126 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:
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

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
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 2530 Intermediate Computing 3
CS 3730/5730 Project Management 1

Electives
Mathematics:
Select two of the following:

- 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 †

Electives

- Any Computer Science course that counts toward the Computer Science B.A. major

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

or

- CS 1520 Data Structures 4
- CS 1800 Discrete Structures 3

Physics:

- PHYSICS 4160/5160 Data Visualization, Modeling and Simulation 3

Required Data Science Project 2-3
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

<table>
<thead>
<tr>
<th>Computer Science:</th>
<th></th>
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<tbody>
<tr>
<td>CS 1520</td>
<td>Data Structures 4</td>
</tr>
<tr>
<td>one course from the following:</td>
<td>3-4</td>
</tr>
<tr>
<td>CS 1120</td>
<td>Media Computation</td>
</tr>
<tr>
<td>CS 1130</td>
<td>Visual BASIC Programming</td>
</tr>
<tr>
<td>CS 1160</td>
<td>C/C++ Programming</td>
</tr>
<tr>
<td>CS ED 1310</td>
<td>Programming Environments for Elementary Education</td>
</tr>
<tr>
<td>CS ED 1320</td>
<td>Fundamentals of Programming</td>
</tr>
<tr>
<td>CS 1510</td>
<td>Introduction to Computing</td>
</tr>
</tbody>
</table>

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 |