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
- Networking and System Administration

### Undergraduate Major (B.A.)
- Computer Science

### Minor
- Computer Science

### Program Certificates
- Computer Applications
- Computer Science

### 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 1140, CS 1150, and CS 1160 are regressive to CS 1520 and any course having it as prerequisite.

## 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 Liberal Arts Core requirements and the following specified major requirements, plus electives to complete the minimum of 126 hours.

### Required

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 1410 (810:041)</td>
<td>Computer Organization</td>
<td>3</td>
</tr>
<tr>
<td>CS 1510 (810:051)</td>
<td>Introduction to Computing</td>
<td>4</td>
</tr>
<tr>
<td>CS 1520 (810:052)</td>
<td>Data Structures</td>
<td>4</td>
</tr>
<tr>
<td>CS 1800 (810:080)</td>
<td>Discrete Structures</td>
<td>3</td>
</tr>
<tr>
<td>CS 2530 (810:053)</td>
<td>Intermediate Computing</td>
<td>3</td>
</tr>
<tr>
<td>CS 3730/5730 (810:173g)</td>
<td>Project Management</td>
<td>1</td>
</tr>
</tbody>
</table>

### Research:
- CS 4800 (810:180) Undergraduate Research in Computer Science (topic pre-approved by department) 1

### Electives

<table>
<thead>
<tr>
<th>Mathematics:</th>
<th>Select four from the following:</th>
<th>13</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 1420 (800:060)</td>
<td>Calculus I ^,#</td>
<td></td>
</tr>
<tr>
<td>MATH 1421 (800:061)</td>
<td>Calculus II #</td>
<td></td>
</tr>
<tr>
<td>MATH 2500 (800:076)</td>
<td>Linear Algebra for Applications</td>
<td></td>
</tr>
<tr>
<td>MATH 3440/5440 (800:176g)</td>
<td>Numerical Analysis</td>
<td></td>
</tr>
<tr>
<td>MATH 3530/5530 (800:143g)</td>
<td>Combinatorics</td>
<td></td>
</tr>
<tr>
<td>MATH 3752/5752 (800:152g)</td>
<td>Introduction to Probability</td>
<td></td>
</tr>
<tr>
<td>STAT 1772 (800:072)</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:
- CS 3530 (810:153) Design and Analysis of Algorithms
- CS 3540 (810:154) Programming Languages and Paradigms
- CS 3810/5810 (810:181g) Theory of Computation
- CS 4550/5550 (810:155g) Translation of Programming Languages *
- CS 4880/5880 (810:188g) Topics in Computer Science †

#### Data and Applications:
- CS 3140/5140 (810:114g) Database Systems
- CS 3150/5150 (810:115g) Information Storage and Retrieval
- CS 3610/5610 (810:161g) Artificial Intelligence *
- CS 3650/5650 (810:166g) Computational Biology
- CS 4620/5620 (810:162g) Intelligent Systems *
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 Liberal Arts Core requirements and the following specified major requirements, plus electives to complete the minimum of 126 hours.

**Required**

Mathematics:
- MATH 1420 (800:060) Calculus I ^ 4
- MATH 1421 (800:061) Calculus II 4

Computer Science:
- CS 1410 (810:041) Computer Organization 3
- CS 1510 (810:051) Introduction to Computing 4
- CS 1520 (810:052) Data Structures 4
- CS 1800 (810:080) Discrete Structures 3
- CS 3430/5430 (810:143g) Operating Systems 3
- CS 3470/5470 (810:147g) Networking 3
- CS 3730/5730 (810:173g) Project Management 1

Electives:
- Mathematics:
  - Select two of the following: 6
  - MATH 1420 (800:060) Calculus I ^,# 2

Total Hours 62

^ MATH 1420 (800:060) has prerequisite of MATH 1140 (800:046), or MATH 1110 (800:043) and MATH 1130 (800:044), or equivalent.

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

# MATH 1420 (800:060), MATH 1421 (800:061), and CS 4740/5740 (810:174g) are 4-hour courses. CS 3610/5610 (810:161g) is a 4-hour course if taken with lab.

† CS 4880/5880 (810:188g) may be counted in a specialty area with department approval for the specific topic.

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 Liberal Arts Core requirements and the following specified major requirements, plus electives to complete the minimum of 120 hours.

**Required**

Computer Science:
- CS 1410 (810:041) Computer Organization 3
- CS 1510 (810:051) Introduction to Computing 4
- CS 1520 (810:052) Data Structures 4
- CS 1800 (810:080) Discrete Structures 3
- CS 2530 (810:053) Intermediate Computing 3
- CS 3730/5730 (810:173g) Project Management 1

Electives
- Mathematics:
  - Select two of the following: 6
  - MATH 1420 (800:060) Calculus I ^,# 2
One course selected from among the Computer Science "area" courses and 2000-level or above courses meeting the Mathematics requirement.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 1420 (800:060)</td>
<td>Calculus II #</td>
</tr>
<tr>
<td>MATH 2500 (800:076)</td>
<td>Linear Algebra for Applications</td>
</tr>
<tr>
<td>MATH 3440/5440 (800:176g)</td>
<td>Numerical Analysis</td>
</tr>
<tr>
<td>MATH 3530/5530 (800:143g)</td>
<td>Combinatorics</td>
</tr>
<tr>
<td>MATH 3752/5752 (800:152g)</td>
<td>Introduction to Probability Methods</td>
</tr>
<tr>
<td>STAT 1772 (800:072)</td>
<td>Introduction to Statistical Methods</td>
</tr>
</tbody>
</table>

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 (810:153) Design and Analysis of Algorithms
- CS 3540 (810:154) Programming Languages and Paradigms
- CS 3810/5810 (810:181g) Theory of Computation
- CS 4550/5550 (810:155g) Translation of Programming Languages *
- CS 4880/5880 (810:188g) Topics in Computer Science †

Data and Applications:

- CS 3140/5140 (810:114g) Database Systems
- CS 3150/5150 (810:115g) Information Storage and Retrieval
- CS 3610/5610 (810:161g) Artificial Intelligence *
- CS 3650/5650 (810:166g) Computational Biology
- CS 4620/5620 (810:162g) Intelligent Systems *
- CS 4880/5880 (810:188g) Topics in Computer Science †

Software Engineering:

- CS 2720 (810:172) Software Engineering
- CS 3120/5120 (810:112g) User Interface Design
- CS 3750/5750 (810:175g) Software Verification and Validation
- CS 4740/5740 (810:174g) Real-Time Embedded Systems *,#
- CS 4880/5880 (810:188g) Topics in Computer Science †

Electives

- CS 2420 (810:142) Computer Architecture and Parallel Programming
- CS 3430/5430 (810:143g) Operating Systems
- CS 3470/5470 (810:147g) Networking
- CS 4400/5400 (810:140g) System Administration
- CS 4410/5410 (810:141g) System Security *
- CS 4420 Applied Systems Forensics *
- CS 4880/5880 (810:188g) Topics in Computer Science †

Electives 3

Total Hours 45

^ MATH 1420 (800:060) has prerequisite of MATH 1140 (800:046), or MATH 1110 (800:043) and MATH 1130 (800:044), or equivalent.

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

# MATH 1420 (800:060), MATH 1421 (800:061), and CS 4740/5740 (810:174g) are 4-hour courses. CS 3610/5610 (810:161g) 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 Computer Science major cannot also receive a Computer Science minor.

Required

- CS 1410 (810:041) Computer Organization 3
- CS 1510 (810:051) Introduction to Computing 4
- CS 1520 (810:052) Data Structures 4
- CS 1800 (810:080) Discrete Structures 3
- CS 2530 (810:053) Intermediate Computing 3

Electives

any Computer Science course that counts toward the Computer Science B.A. major 9

Total Hours 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 Applications

Required

- CS 1000 (810:021) Computing Skills and Concepts 3
- CS 1010 (810:022) Microcomputer Applications and Systems Integration 3
- CS 1020 (810:023) Microcomputer Systems 3

Electives

Computer Science:

- CS 1130 (810:030) Visual BASIC Programming 3
- CS 2880 (810:088) Topics in Computing 3
Certificate in Computer Science

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

**Required**

<table>
<thead>
<tr>
<th>Computer Science:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>one course from the following:</td>
<td>3-4</td>
</tr>
<tr>
<td>CS 1120 (810:056)</td>
<td>Media Computation</td>
</tr>
<tr>
<td>CS 1130 (810:030)</td>
<td>Visual BASIC Programming</td>
</tr>
<tr>
<td>CS 1140</td>
<td>Programming Environments for Secondary Education</td>
</tr>
<tr>
<td>CS 1150</td>
<td>Programming Environments for Elementary Education</td>
</tr>
<tr>
<td>CS 1160 (810:036)</td>
<td>C/C++ Programming</td>
</tr>
<tr>
<td>CS 1510 (810:051)</td>
<td>Introduction to Computing</td>
</tr>
<tr>
<td>CS 1520 (810:052)</td>
<td>Data Structures 4</td>
</tr>
<tr>
<td>Total Hours</td>
<td>13-14</td>
</tr>
</tbody>
</table>

Two courses, from ONE of the following groups:

**Group 1:**

| CS 1800 (810:080) | Discrete Structures |
| CS 2530 (810:053) | Intermediate Computing |

**or Group 2:**

| CS 1410 (810:041) | Computer Organization |
| CS 2420 (810:142) | Computer Architecture and Parallel Programming |