Computer Science and Engineering

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Degrees Offered: B.S., M.S., and Ph.D. in Computer Science

The Department of Computer Science and Engineering is focused on an exciting and rapidly growing body of knowledge with constantly changing emphasis.

The curriculum of the department includes courses in both theory and application. It prepares students to apply the principles of logic and mathematics to the design and construction of hardware and software systems using current engineering paradigms and also exposes them to major applications of computing.

The *Bachelor of Science in Computer Science* program is accredited by the Computing Accreditation Commission of ABET, https://www.abet.org. The program emphasizes fundamental principles while striking a careful balance between the applications of computer technology and the theory of computing. In addition to the required fundamental computer science courses, students must also take technical electives to broaden their knowledge in major computer science application areas. Graduates of this program will be well prepared for both industry employment and graduate study.

Our graduate programs provide students the opportunity to take courses, select advisory committee members, and pursue research in an area of interest to a faculty supervisor. The *Master of Science in Computer Science* program is designed for students who wish to further broaden or deepen their knowledge of computer science and applications. Master's students usually participate in faculty research projects to complete their thesis or (non-thesis) independent study report.

New Mexico Tech's Department of Computer Science and Engineering also offers a *Ph.D. in Computer Science* program. The Ph.D. program is appropriate for students with motivation for research and either a superior track record in coursework or substantial experience in industrial research and development.

The department has been certified, since 2002, by the National Security Agency and the Department of Homeland Security as a National Center of Academic Excellence in Information Assurance Education. Since 2009, the department has also been certified as a National Center of Academic Excellence in Information Assurance Research.

The department has its own network of computers and servers plus a variety of other equipment in several laboratories. The Tech Computer Center supports a larger network that is also available to the department. Computing equipment at the research labs associated with Tech includes both symmetric multiprocessors, GPU compute servers and special purpose massively parallel computers. The department also has access to massively parallel machines at national laboratories and supercomputing centers.

Mission

Our mission is to produce computer science graduates who, trained in the design, implementation, and analysis of computational systems and skilled in technical communication, will contribute towards the advancement of computing science and technology.

Program Educational Objectives

Within a few years of graduating with a B.S. degree in Computer Science, our students should be able to demonstrate that they have:

1. the ability to design, implement, and analyze computational systems;
2. the capability to tackle complex computer science related problems in the real world;
3. contributed towards the advancement of computing science and technology;
4. the capacity to work effectively with peers in computational tasks; and
5. cognizance of ethical, social, and legal issues pertaining to computer science.

Student Outcomes

By the time of their graduation, the undergraduate academic program in Computer Science should enable our graduates to:

1. analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions;
2. design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline;
3. effectively in a variety of professional contexts;
4. professional responsibilities and make informed judgments in computing practice based on legal and ethical principles;
5. effectively as a member or leader of a team engaged in activities appropriate to the program's discipline; and
6. computer science theory and software development fundamentals to produce computing-based solutions.

Undergraduate Program

Bachelor of Science in Computer Science

Minimum credit hours required—123
In addition to the General Education and Institute Core Curriculum (page 99), the following courses are required:

CSE 101 (2), 113 (4), 122 (3), 213 (3), 221 (3), 222 (3), 241 (3), 324 (3), 325 (4), 326 (3), 331 (3), 342 (3), 344 (4), 353 (3), 363 (3), 382 (3), 423 (4)
MATH 352 (3), 382 (3), 382L (1)
Technical Electives: A sequence of 12 hours of CSE courses numbered 300 or higher, pre-approved by the student's advisor and the CSE Department, with no more than one

course numbered CSE 485. Students are encouraged to select a coherent set of courses as technical electives that will prepare them for a specific focus in their career;
All the courses listed above must be taken for a letter grade; General Electives to complete 123 credit hours.

Sample Curriculum 1 for the* Bachelor of Science in Computer Science *program

Semester 1 (Fall)
4 MATH 1510 (calculus)
2 CSE 101 (intro to comp science & info tech)
4 CSE 113 & 113L (intro to programming)
5 PHYS 1310 & 1310L (general physics I)
15 Total credit hours

Semester 2 (Spring)
4 MATH 1520 (calculus)
3 CSE 122 (algorithms and data structures)
5 PHYS 1320 & 1320L (general physics II)
3 ENGL 1110 (college English)
15 Total credit hours

Semester 3 (Fall)
3 CSE 221 (computer systems)
3 CSE 241 (foundations of computer science)
4 CHEM 1215 & 1215L (general chemistry I)
3 ENGL 1120 (college English)
3Humanities
16 Total credit hours

Semester 4 (Spring)
3 CSE 213 (intro object oriented programming)
3 CSE 222 (systems programming)
4 Math 382 & 382L (probability and statistics)
4 CHEM 1225 & 1225L (general chemistry II)
3 MATH 352 (basic concepts of mathematics)
17 Total credit hours

Semester 5 (Fall)
4 CSE 325 & 325L (operating systems)
4 CSE 344 & 344L (design & analysis algorithms)
3 CSE 353 (intro to computer networks)
3 ENGL 341 (technical writing)
14 Total credit hours *

Semester 6 (Spring)
3 CSE 326 (software engineering)
3 CSE 342 (formal languages and automata)
3 CSE 324 (principles programming languages)
3 CSE 363 (secure computing)
3 Technical Elective
15 Total credit hours

Semester 7 (Fall)
3 Creative & Fine Arts
3 Humanities
3 Technical Elective
3 Technical Elective
3 Social Science
15 Total credit hours

Semester 8 (Spring)
4 CSE 423 & 423L (compiler writing)
3 CSE 331 (computer architecture)
3 CSE 382 (ethics of computing and info technologies)*
3 Social Science
3 Technical Elective
16 Total credit hours

(satisfies Area 7) In order to earn or retain the NM Lottery Scholarship, students must earn 15 credits each semester. Please see your advisor for details.

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Sample Curriculum 2 for the* Bachelor of Science in Computer Science *program

Semester 1 (Spring)
4 MATH 1510 (calculus)
4 CSE 113 & 113L (introduction to programming)
3 ENGL 1110 (college English)
4 CHEM 1215 & 1215L (general chemistry I)
15 Total credit hours

Semester 2 (Fall)
4 MATH 1520 (calculus)
2 CSE 101 (intro to comp science & info tech)
3 CSE 122 (algorithms and data structures)
4 CHEM 1225 & 1225L (general chemistry II)
3 ENGL 1120 (college English)
16 Total credit hours

Semester 3 (Spring)
3CSE 213 (intro object oriented programming)
3 CSE 222 (systems programming)
3 CSE 324 (principles programming languages)
5 PHYS 1310 & 1310L (general physics I)
3 Social Science
17 Total credit hours

Semester 4 (Fall)
3 CSE 221 (computer systems)
3 CSE 241 (foundations of computer science)
3 CSE 353 (intro to computer networks)
5 PHYS 1320 & 1320L (general physics II)
3 Humanities
17 Total credit hours

Semester 5 (Spring)
3 CSE 326 (software engineering)
3 ENGL 341 (technical writing)
3 CSE 342 (formal languages and automata)
4 MATH 382 & 382L (probability and statistics)
3 MATH 352 (basic concepts of mathematics)
16 Total credit hours

Semester 6 (Fall)
4 CSE 325 & 325L (operating systems)
4 CSE 344 & 344L (design & analysis algorithms)
3 Technical Elective
3Humanities
14 Total credit hours *

Semester 7 (Spring)
4 CSE 423 & 423L (compiler writing)
3 CSE 331 (computer architecture)
3 CSE 363 (secure computing)
3 CSE 382 (ethics of computing and info technologies)*
3 Technical Elective
16 Total credit hours

*(satisfies Area 7)

Semester 8 (Fall)
3 Technical Elective
3 Technical Elective
3 Social Science
3 Creative & Fine Arts
12 Total credit hours

* In order to earn or retain the NM Lottery Scholarship, students must earn 15 credits each semester. Please see your advisor for more information.

Minor in Computer Science

Minimum credit hours required: 28

The following courses are required:

CSE 113 (4) and CSE 122(3)

Any four out of CSE 324 (3), CSE 325(4), CSE 326(3), CSE 331(3), CSE 342(3), CSE 344(4), and CSE 353(3) along with their respective pre-requisites.

Minor in Computer Engineering

Minimum credit hours required: 25

The following courses are required:

CSE 113 (4), CSE 122(3), CSE 221 (3), CSE 222 (3), EE 211 (3), EE 252 (3), and EE 351 (3)

Any one out of CSE 325(4), CSE 326(3), CSE 331(3), CSE 353(3) along with their respective pre-requisites.

Minor in Cybersecurity

Minimum credit hours required: 22

The following courses are required:

CSE 113 (4), CSE 122(3), CSE 221 (3), CSE 222 (3),,CSE 353(3), CSE 363 (3), CSE 441 (3), CSE 461 (3), and CSE 561 (3)

Interdisciplinary Data Science Minor (This minor is offered jointly by computer science and mathematics.)

Minimum credit hours required: 20

The following courses are required:

• CSE or IT 107 (4 cr) or CSE or IT 113 (4 cr)

• CSE 207 (3 cr)

• CSE 411 (3 cr)

• MATH 2420 (3 cr)

• MATH 382+MATH 382L (4 cr)

• One of

– CSE 465 (3)

– CSE 466 (3)

– MATH 441 (3)

Junior Standing in Computer Science:

Students are deemed to have attained *junior standing in Computer Science* when they have completed the four required *2xx* courses, i.e., CSE 213, CSE 221, CSE 222, and CSE 241, each with a grade of *C* or higher.

Undergraduate Honors Thesis:

Outstanding students may pursue a *Computer Science Honors Thesis* option which involves writing a thesis based on original research, defending it before a thesis committee after enrolling first in 1 credit hour of CSE 493 *Undergraduate Thesis* and then in 2 credit hours of CSE 494 *Undergraduate Thesis* over two semesters, and presenting the research in a public colloquium. The colloquium may be a prelude to the thesis defense. CSE 493 plus 494 can substitute for only one of the required technical electives.

In order to apply, a student must

be a CS major;

have completed 12 credits of required core courses for the CS major at the 300 level or higher;

have an overall CGPA of at least 3.0 and also a CGPA of at least 3.0 in the courses enumerated in the catalog in the list of required courses for the CS major that are completed at the time of application;

have a full-time CSE faculty member as research advisor and a thesis topic;

permission of his/her academic advisor;

form an Undergraduate Honors Thesis Committee of three members with at least two CSE full-time faculty members including the research advisor; and

submit a filled-out application form to the CSE Department Chair indicating approvals of the academic and research advisors.

The thesis must follow the format specified by NMT's Center for Graduate Studies. Until the defense, the student must maintain an overall CGPA of at least 3.0 and a CGPA of at least 3.0 in the courses enumerated in the catalog in the list of required courses for the CS major. In the semester the student enrolls in CSE 494, the student must defend his/her thesis. After the thesis defense, the student's Undergraduate Honors Thesis Committee will vote to either accept or reject the thesis; and the research advisor, in consultation with the committee, will assign a letter grade for CSE 494. A rejected thesis should correspond to a grade less than *C*; an accepted thesis *C* or higher. If approved, the committee will vote to decide if the thesis should be awarded a departmental certificate bestowing *High Honors* or *Highest Honors*; generally, these should correspond to *A-minus* and *A* respectively.

Graduate Program:

Graduate Certificate in Cybersecurity

The Cybersecurity Graduate Certificate offers graduate students and post-baccalaureate professionals an opportunity to build and strengthen their capabilities in cybersecurity for academic and professional work. The 12 credit hours of coursework required for the certificate include the foundational overview of cybersecurity and in addition allow the student to focus on cybersecurity courses that are of particular interest.

Requirements for the Cybersecurity Graduate Certificate are:

1.CSE 561, Foundations of Information Security

2. 9 credits from the following:

CSE 563, Access Control & System Security
CSE 570, Privacy in Mobile Environments
CSE 541, Advanced Cryptography
CSE 564, Secure System Administration
CSE 554, Computer Network Security
CSE 557, Hardware-Based Network Security
EMGT 509, Systems, Risk, and Decision Analysis