COMPUTER SCIENCE

Description

Website: https://computing.unl.edu
email: computing@unl.edu

The University of Nebraska–Lincoln School of Computing offers Nebraska's only comprehensive program of higher education, research, and service outreach in computer science, computer engineering, and software engineering.

The School of Computing offers a challenging baccalaureate degree program in computer science that prepares graduates for professional practice as computer scientists, provides the basis for advanced studies in the field, and establishes a foundation for lifelong learning and achievement. The bachelor of science degree in computer science is accredited by the Computing Accreditation Commission of ABET, http://www.abet.org.

The School of Computing also offers a degree of bachelor of science in computer engineering and a bachelor of science in software engineering. All students with a major in the School of Computing should see their advisor during the first semester to ensure they understand the requirements for each School of Computing undergraduate degree program. Students should consult with their advisors each semester for registration advising.

Introductory Courses

Entering students may select from several introductory courses according to their interests. The Computer Science I courses (CSCE 155A Computer Science I, CSCE 155H Honors: Computer Science I, CSCE 155E Computer Science I: Systems Engineering Focus, and CSCE 155T Computer Science I: Informatics Focus) all provide a foundation in designing and programming computing solutions and prepare students for more advanced CSCE courses, including CSCE 156 Computer Science II . These courses are designed to meet different interests. CSCE 155A is designed for students majoring in Computer Science. CSCE 155H is for honors students. CSCE 155E emphasizes computing for systems engineering, such as control systems, mobile computing, and embedded devices and is designed for students majoring in computer engineering. CSCE 155T focuses on data and information processing, such as document or database applications, online commerce, or bioinformatics. CSCE 156 is for students with a background in designing and programming computing solutions, such as is provided by CSCE 155A. CSCE 101 Fundamentals of Computer Science is for students seeking a broad introduction to computer science with brief instruction in computer programming. CSCE 100 Introduction to Informatics focuses on the use of data-centric and information technologies and on issues and challenges in the application of computing in the sciences, engineering, the humanities, and the arts.

Program Assessment. In order to assist the school in evaluating the effectiveness of its programs, majors will be required in their senior year to complete a written exit survey. The results of participation in these assessment activities will in no way affect a student's GPA or graduation.

Graduate Programs. The School of Computing offers several graduate degree programs: master of science in computer science, accelerated master of science in computer science, master of science in computer science with a computer engineering specialization, master of science in computer science with a bioinformatics specialization, doctor of philosophy in computer science, doctor of philosophy in engineering with a computer engineering specialization, doctor of philosophy in computer science with a bioinformatics specialization, and joint doctor of philosophy in computer science and mathematics. See the *Graduate Studies Catalog* for details.

Major Department Admission

Students are expected to meet minimum university entrance requirements. After being admitted to the college, students desiring to pursue a degree in computer science must go through the Professional Admission process, which is automatically performed for qualifying students at the end of the sophomore year. In order to be considered for Professional Admission to the computer science program, students must receive a "P" or "C" or above in CSCE 310 Data Structures and Algorithms (RAIK 283H Honors: Software Engineering III) and have a GPA of at least 2.5 (semester and cumulative). If a student's cumulative GPA drops below 2.4, the student may be placed on restricted status, may be removed from the College, and may not be able to graduate.

College Requirements

College Admission

College Entrance Requirements

Students must have high school credit for (one unit is equal to one high school year):

1. Mathematics – 4 units: 2 of algebra, 1 of geometry, and 1 of precalculus and trigonometry
2. English – 4 units
3. Natural sciences – 3 units that must include 1 unit of physics and 1 unit of chemistry (chemistry requirement waived for students in construction management or computer science)
4. Foreign language – 2 units of a single foreign language
5. Social studies – 3 units
6. Students having a composite ACT score of 28 or greater (or equivalent SAT score) will be admitted to the College of Engineering even if they lack any one of the following: trigonometry, chemistry, or physics. Students without test scores who are missing a full unit of trigonometry/pre-calculus/calculus or chemistry or physics will be evaluated through College Review.
7. Students having an ACT score of 19 or less in English (or equivalent SAT score) or a grade lower than B in high school English, must take ENGL 150 Writing and Inquiry or ENGL 151 Writing and Argument.

A total of 16 units is required for admission.

Engineering requires that student performance meet one of the following standards: composite ACT of 24, SAT of 1180, ACT Math subscore of 24, SAT Math subscore of 580, or a 3.5 cumulative GPA.

Any domestic first-year student who does not gain admission to Engineering but does gain admission to the University of Nebraska-Lincoln (UNL) will be reviewed through College Review. College Review is conducted through the College Review Committee which considers factors beyond standardized testing. Any first-year student who is not admitted through college review is placed in Pre-Engineering (PENG) with the Exploratory and Pre-Professional Advising Center (Explore Center). Students in the Explore Center can transfer to the College of Engineering once college admission requirements are met.

Students for whom English is not their language of nurture must meet the minimum English proficiency requirements of the University.

Students who lack entrance units may complete precollege training by Independent Study through the University of Nebraska−Lincoln Office of On-line and Distance Education, in summer courses, or as a part of their first or second semester course loads while in the Explore Center or other colleges at UNL.

Students should consult their advisor, their department chair, or Engineering Student Services (ESS) if they have questions on current policies.

Other Admission Requirements

Students who transfer to the University of Nebraska−Lincoln from other accredited colleges or universities and wish to be admitted to the College of Engineering (COE) must meet COE first-year student entrance requirements, have a minimum cumulative GPA of 2.5, and be calculus-ready. Students not meeting either of these requirements must enroll in the Explore Center or another University college until they meet COE admission requirements. Students transferring from UNO, UNL, or UNK to the College of Engineering must be in good academic standing with their institution.

The COE accepts courses for transfer for which a C or better grade was received. Although the University of Nebraska−Lincoln accepts D grades from the University of Nebraska Kearney and the University of Nebraska Omaha, not all majors in the COE accept such low grades. Students must conform to the requirements of their intended major and, in any case, are strongly encouraged to repeat courses with a grade of C- or less.

Students who were previously admitted to COE and are returning to the College of Engineering must demonstrate a cumulative GPA of 2.5 to be readmitted to COE.

College Degree Requirements

Grade Rules

Grade Appeals

In the event of a dispute involving any college policies or grades, the student should appeal to their instructor, and appropriate department chair or school director (in that order). If a satisfactory solution is not achieved, the student may appeal their case through the College Academic Appeals Subcommittee.

Catalog Rule

Students must fulfill the requirements stated in the catalog for the academic year in which they are first admitted at the University of Nebraska−Lincoln. In consultation with advisors, a student may choose to follow a subsequent catalog for any academic year in which they are admitted to and enrolled as a degree-seeking student at Nebraska in the College of Engineering. Students must complete all degree requirements from a single catalog year. The catalog which a student follows for degree requirements may not be more than 10 years old at the time of graduation.

Students who have transferred from a community college may be eligible to fulfill the requirements as stated in the catalog for an academic year in which they were enrolled at the community college prior to attending the University of Nebraska-Lincoln.#This decision should be made in consultation with the student's College of Engineering academic advising team (e.g., ESS professional advisor and the chief faculty advisor for the student's declared degree program).#The chief faculty advisor has the final authority for this decision. Eligibility is based on a) enrollment in a community college during the catalog year the student wishes to utilize,

b) maintaining continuous enrollment of at least 12 credit hours per semester at the previous institution for at least 2 semesters, and c) continuous enrollment at the University of Nebraska-Lincoln within 1 calendar year from the student's last term at the previous institution. #Students must complete all degree requirements from a single catalog year and within the timeframe allowable for that catalog year.

Learning Outcomes

Graduates of the computer science program will be able 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. Communicate effectively in a variety of professional contexts.
4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.
6. Apply computer science theory and software development fundamentals to produce computing-based solutions.

The above student outcomes have been approved by the ABET Engineering Area Delegation for use beginning with the 2019-20 academic year, and have been adopted by the School of Computing faculty.

Major Requirements (Non-Raikes)

Core Requirements

Required Computer Science Courses

CSCE 10	Introduction to CSE	0
Select one of the following:		3
CSCE 155A	Computer Science I	
CSCE 155H	Honors: Computer Science I	
CSCE 155E	Computer Science I: Systems Engineering Focus	
CSCE 155T	Computer Science I: Informatics Focus	
CSCE 156	Computer Science II	4
or CSCE 156H	Honors: Computer Science II	
CSCE 231	Computer Systems Engineering	4
CSCE 235	Introduction to Discrete Structures	3
or CSCE 235H	Honors: Introduction to Discrete Structures	
CSCE 251	Unix Programming Environment	1
CSCE 310	Data Structures and Algorithms	3
or CSCE 310H	Honors: Data Structures and Algorithms	
CSCE 322	Programming Language Concepts	3
CSCE 361	Software Engineering	3
or CSCE 361H	Software Engineering	
Credit Hours Subtotal:		24

Specific Major Requirements

Depth Courses

CSCE 351	Operating System Kernels	3
or CSCE 451	Operating Systems Principles	

CSCE 423	Design and Analysis of Algorithms	3
or CSCE 428	Automata, Computation, and Formal Languages	
Credit Hours Subtotal:		**6**
Technical Electives		
Select 9-11 hours of technical courses from any CSCE 300- or 400-level course. [1] [2] [3]		9-11
Credit Hours Subtotal:		**9-11**
Senior Design Experience (ACE 8 & ACE 10)		
Select one of the following sequences. [4]		6
CSCE 486 & CSCE 487	Computer Science Professional Development and Computer Science Senior Design Project	
CSCE 486H & CSCE 487H	Honors Computer Science Professional Development and Honors Computer Science Senior Design Project	
CSCE 401H & CSCE 402H	Honors: RAIK Design Studio I and Honors: RAIK Design Studio II	
Credit Hours Subtotal:		**6**
Total Credit Hours		**21-23**

[1] *Select from any CSCE/RAIK 300 or 400 course except* CSCE 320, CSCE 391, *and RAIK courses lacking CSCE equivalents (except that RAIK 284H, RAIK 401H, RAIK 402H, RAIK 403H, RAIK 404H, RAIK 405H, and RAIK 406H are acceptable as technical electives).*

[2] *Up to 3 hours of* CSCE 495 *can be used for technical courses. No more than one of* MATH 428, MATH 433, MATH 439, MATH 450, MATH 452 *may be used. At least 6 credit hours of technical courses must be other than* CSCE 394, CSCE 399, CSCE 495, CSCE 493, CSCE 498, CSCE 399H, RAIK 401H, RAIK 402H, RAIK 403H, RAIK 404H, RAIK 405H, *and* RAIK 406H.

[3] CSCE 101 *or* ENGR 101 *may be used to satisfy a technical elective for Computer Science majors if taken at UNL prior to taking* CSCE 155, CSCE 156/CSCE 156H, CSCE 310/CSCE 310H, *and* CSCE 361/CSCE 361H.

[4] Course sequences should be taken in consecutive semesters. CSCE 401H and CSCE 402H are by invitation and permission only.

Focus Areas

Computer science majors have the option to declare one or more focus areas from the areas listed below. To receive a focus area certificate from the School of Computing, students must meet all degree requirements and complete three courses (9 hours) with a grade of C or higher in each course within the desired focus area(s). To declare a focus area, contact your advisor. Focus areas available to computer science majors include:

- **Artificial Intelligence (AI):** CSCE 421, CSCE 475, CSCE 476, CSCE 478, CSCE 479.
- **Computer Architecture & High-Performance Computing:** CSCE 411, CSCE 430, CSCE 435, CSCE 436, CSCE 456, CSCE 457.
- **CyberSecurity:** CSCE 438, CSCE 457, CSCE 462, CSCE 463, CSCE 477.
- **Data Science and Informatics:** CSCE 410, CSCE 411, CSCE 412, CSCE 413, CSCE 464, CSCE 470, CSCE 471, CSCE 472, CSCE 473, CSCE 474, CSCE 478, CSCE 479.
- **Foundations of Computer Science:** CSCE 421, CSCE 423, CSCE 424, CSCE 428, CSCE 440, CSCE 477.
- **IoT, Robotics, and Embedded Systems:** CSCE 436, CSCE 438, CSCE 439, CSCE 454, CSCE 459, CSCE 460, CSCE 473, CSCE 476.
- **Networking:** CSCE 438, CSCE 455, CSCE 456, CSCE 458, CSCE 459, CSCE 462, CSCE 463, CSCE 465.
- **Software Engineering:** CSCE 425, CSCE 453H, CSCE 454, CSCE 460, CSCE 461, CSCE 464, CSCE 466, CSCE 467, CSCE 468.
- **User-Centered Computing:** CSCE 411, CSCE 412, CSCE 453H, CSCE 454, CSCE 470.

Ancillary Requirements

Breadth Courses - Arts, Humanities and Social Sciences		**6**
Fulfilled by the completion of six (6) credit hours in Arts, Humanities and Social Sciences courses. At least three (3) credit hours must come from courses certified as "Diversity in US Communities."		
Select from a set of approved courses in Anthropology, Art History, Classics, Communication Studies, Economics, English, History, Ethnic Studies, Geography, Foreign Languages & Literature, Philosophy, Political Science, Psychology, Religious Studies, Sociology, and Women's and Gender Studies as listed in the degree audit.		
Credit Hours Subtotal:		**6**
Technical Writing (ACE 1)		
JGEN 200	Technical Communication I	3
or BSAD 220H	Honors Business Writing	
Credit Hours Subtotal:		**3**
Foreign Language		
Fulfilled by the completion of the second-year sequence in a single foreign language in one of the following departments: Classics and religious studies or modern languages and literatures. Instruction is currently available in Arabic, Chinese, Czech, French, German, Greek, Japanese, Latin, Russian, and Spanish.		
A student who has completed the fourth-year level of one foreign language in high school is exempt from the language requirement, but encouraged to continue on in their language studies.		
Mathematics		
MATH 106	Calculus I (ACE 3)	5
MATH 107	Calculus II	4
MATH 314	Linear Algebra	3
STAT 380 / RAIK 270H	Statistics and Applications	3
Credit Hours Subtotal:		**15**
Science (ACE 4)		
Select 12 credit hours of courses intended for science or engineering majors including at least one laboratory. Acceptable disciplines and courses are (not an exhaustive list):		12
Chemistry		
CHEM 109A & CHEM 109L	General Chemistry I and General Chemistry I Laboratory [1]	4
CHEM 110A & CHEM 110L	General Chemistry II and General Chemistry II Laboratory [1]	4
CHEM 221A & CHEM 221L	Elementary Quantitative Analysis and Elementary Quantitative Analysis Laboratory [1]	

| CHEM 113A
& CHEM 113L | Fundamental Chemistry I
and Fundamental Chemistry I Laboratory [1] | 4 |
| CHEM 114 | Fundamental Chemistry II | |

Physics and Astronomy

PHYS 141	Elementary General Physics I [1]	
PHYS 142	Elementary General Physics II [1]	
PHYS 211	General Physics I	
PHYS 221	General Physics Laboratory I [1]	
PHYS 212	General Physics II	
PHYS 222	General Physics Laboratory II [1]	
PHYS 213	General Physics III	
PHYS 223	General Physics Laboratory III [1]	
ASTR 204	Introduction to Astronomy and Astrophysics	
ASTR 224	Astronomy and Astrophysics Laboratory [1]	

Biological Sciences

BIOS 111	Introduction to Microbiology and Human Health [1]	
BIOS 205	Genetics, Molecular and Cellular Biology Laboratory [1]	
BIOS 206	General Genetics	
BIOS 207	Ecology and Evolution [1]	
LIFE 120 & LIFE 120L	Fundamentals of Biology I and Fundamentals of Biology I laboratory [1]	
LIFE 121 & LIFE 121L	Fundamentals of Biology II and Fundamentals of Biology II Laboratory [1]	

Earth and Atmospheric Sciences

GEOG 155	Elements of Physical Geography [1]	
GEOL 101	Dynamic Earth [1]	
GEOL 103	Earth Through Time [1]	
GEOL 410	Geochemistry	
METR 100	Weather and Climate [1]	
METR 205	Introduction to Atmospheric Science [1]	
METR 370	Applied Climatology	

Anthropology

ANTH 242	Introduction to Biological Anthropology	
ANTH 242L	Introduction to Biological Anthropology Laboratory [1]	
Credit Hours Subtotal:		**24**
ACE Requirements		
Select one course each from ACE 2, 5, 6, 7, and 9		15
Credit Hours Subtotal:		**15**
Total Credit Hours		**63**

[1] *Indicates a lab course or that a lab is included with the course.*

Minor Requirement

Complete at least one minor or a second major.

Major Requirements (Raikes School Students)

Core Requirements

Required Computer Science Courses

RAIK 183H	Honors: Computer Problem Solving Essentials	4
RAIK 184H	Honors: Software Development Essentials	4
RAIK 283H	Honors: Software Engineering III	4
RAIK 284H	Software Engineering IV (ACE 2)	3
CSCE 231	Computer Systems Engineering	4
CSCE 251	Unix Programming Environment	1
CSCE 322	Programming Language Concepts	3
Credit Hours Subtotal:		**23**

Required Raikes School Requirements

RAIK 10	Raikes School Freshman Seminar	0
CSCE 163H	Honors: Innovation Processes and Software Engineering Fundamentals	3
RAIK 185H	Honors: Foundations of Leadership I	1
RAIK 186H	Honors: Foundations of Leadership II	1
RAIK 188H	Honors: Introductory Communication Seminar	1
RAIK 40	Professional and Life Skills	0
Credit Hours Subtotal:		**6**

Specific Major Requirements

Depth Courses

CSCE 351	Operating System Kernels	3
or CSCE 451	Operating Systems Principles	
CSCE 423	Design and Analysis of Algorithms	3
or CSCE 428	Automata, Computation, and Formal Languages	
Credit Hours Subtotal:		**6**
Technical Electives		
RAIK 370H	Honors: Data and Models II: Data Science Fundamentals	3
RAIK 403H	Honors: RAIK Design Studio III	3
Select an additional CSCE or RAIK 300- or 400-level course. [1]		3-4
Credit Hours Subtotal:		**9-10**
Senior Design Experience (ACE 8 & ACE 10)		
RAIK 401H & RAIK 402H	Honors: RAIK Design Studio I and Honors: RAIK Design Studio II	6
Credit Hours Subtotal:		**6**
Total Credit Hours		**21-22**

[1] *Select from any CSCE or RAIK 300- or 400-level course except* CSCE 320, CSCE 391,CSCE 399, CSCE 399H, CSCE 495, CSCE 495, CSCE 493, CSCE 493A, CSCE 498, RAIK 404H, *and* RAIK 406H.

Ancillary Requirements

Breadth Courses - Arts, Humanities and Social Sciences		**6**
Fulfilled by the completion of six (6) credit hours in Arts, Humanities and Social Sciences courses. At least three (3) credit hours must come from courses certified as "Diversity in US Communities."		
Select from a set of approved courses in Anthropology, Art History, Classics, Communication Studies, Economics, English, History, Ethnic Studies, Geography, Foreign Languages & Literature, Philosophy, Political Science, Psychology, Religious Studies, Sociology, and Women's and Gender Studies as listed in the degree audit.		
Credit Hours Subtotal:		6

Technical Writing (ACE 1)		
RAIK 288H / BSAD 220H	Honors Business Writing	3
Credit Hours Subtotal:		3

Foreign Language		
Fulfilled by the completion of the second-year sequence in a single foreign language in one of the following departments: Classics and religious studies or modern languages and literatures. Instruction is currently available in Arabic, Chinese, Czech, French, German, Greek, Japanese, Latin, Russian, and Spanish.		
A student who has completed the fourth-year level of one foreign language in high school is exempt from the language requirement, but encouraged to continue on in their language studies.		

Mathematics		
MATH 106	Calculus I (ACE 3)	5
MATH 107	Calculus II	4
MATH 314	Linear Algebra	3
RAIK 270H / STAT 380	Statistics and Applications	3
Credit Hours Subtotal:		15

Science (ACE 4)		
Select 12 credit hours of courses intended for science or engineering majors including at least one laboratory. Acceptable disciplines and courses are (not an exhaustive list):		12

Chemistry

CHEM 109A & CHEM 109L	General Chemistry I and General Chemistry I Laboratory [1]	4
CHEM 110A & CHEM 110L	General Chemistry II and General Chemistry II Laboratory [1]	4
CHEM 221A & CHEM 221L	Elementary Quantitative Analysis and Elementary Quantitative Analysis Laboratory [1]	
CHEM 113A & CHEM 113L	Fundamental Chemistry I and Fundamental Chemistry I Laboratory [1]	4
CHEM 114	Fundamental Chemistry II	

Physics and Astronomy

PHYS 141	Elementary General Physics I [1]	
PHYS 142	Elementary General Physics II [1]	
PHYS 211	General Physics I	
PHYS 221	General Physics Laboratory I [1]	
PHYS 212	General Physics II	
PHYS 222	General Physics Laboratory II [1]	
PHYS 213	General Physics III	
PHYS 223	General Physics Laboratory III [1]	
ASTR 204	Introduction to Astronomy and Astrophysics	
ASTR 224	Astronomy and Astrophysics Laboratory [1]	

Biological Sciences

BIOS 111	Introduction to Microbiology and Human Health [1]	
BIOS 205	Genetics, Molecular and Cellular Biology Laboratory [1]	
BIOS 206	General Genetics	
BIOS 207	Ecology and Evolution [1]	
LIFE 120 & LIFE 120L	Fundamentals of Biology I and Fundamentals of Biology I laboratory [1]	
LIFE 121 & LIFE 121L	Fundamentals of Biology II and Fundamentals of Biology II Laboratory [1]	

Earth and Atmospheric Sciences

GEOG 155	Elements of Physical Geography [1]	
GEOL 101	Dynamic Earth [1]	
GEOL 103	Earth Through Time [1]	
GEOL 410	Geochemistry	
METR 100	Weather and Climate [1]	
METR 205	Introduction to Atmospheric Science [1]	
METR 370	Applied Climatology	

Anthropology

ANTH 242	Introduction to Biological Anthropology	
ANTH 242L	Introduction to Biological Anthropology Laboratory [1]	
Credit Hours Subtotal:		12-13

ACE Requirements		
Select one course each from ACE 2, 5, 6, 7, and 9		15
Credit Hours Subtotal:		15
Total Credit Hours		**51-52**

[1] *Indicates a lab course or that a lab is included with the course.*

Minor Requirement

The business minor for Raikes is required for computer science majors in the Raikes School.

Additional Major Requirements

Grade Rules

C- and D Grades

A grade of C or above is required for all courses in the major and minor, excluding ancillary courses.

Pass/No Pass

Students in the computer science program must take CSCE 10 with the grading option Pass/No Pass. In addition to the University of Nebraska–

Lincoln's requirements regarding Pass/No Pass grading, the following restrictions apply to courses taken with the Pass/No Pass option:

- Up to six (6) credit hours of Pass/No Pass coursework can be taken in the major (CSCE) courses.
- Up to 24 credit hours can be taken with the Pass/No Pass grading option to fulfill Ancillary course requirements and/or ACE requirements.
- A maximum of 24 credit hours of Pass/No Pass grades can be applied toward degree requirements. This includes all Pass/No Pass grades earned at the University of Nebraska–Lincoln and other U.S. schools.

Course Level Requirement

Thirty (30) of the 120 credit hours must be in courses numbered at the 300 or 400 level. Of those 30 hours, 15 credit hours must be completed in residence at the University of Nebraska–Lincoln. Thirteen (13) hours of the CSCE courses must be at the 400 level for students not completing the Raikes School version of the major.

Residency Requirement

Students must complete at least 30 of the 120 total hours for their degree at the University of Nebraska–Lincoln. Students must complete at least half of their major coursework, including 6 credit hours at the 300 or 400 level in their major, and 15 of the 30 credit hours required at the 300 or 400 level in residence. Credit earned during education abroad may be used toward the residency requirement only if students register through the University of Nebraska–Lincoln.

Restriction

Students majoring in computer science may not declare a minor in informatics or software development.

Requirements for Minor Offered by Department

Minor in Computer Science (Non-Raikes)

Eighteen (18) hours of computer science courses as follows.

Select one of the following:		3
CSCE 155A	Computer Science I	
CSCE 155H	Honors: Computer Science I	
CSCE 155E	Computer Science I: Systems Engineering Focus	
CSCE 155T	Computer Science I: Informatics Focus	
Select at least one of the following:		3-4
CSCE 156	Computer Science II	
or CSCE 156H	Honors: Computer Science II	
CSCE 311	Data Structures and Algorithms for Informatics	
CSCE 300- or 400-level course [1]		3
Additional CSCE courses [1][2]		8-9
Total Credit Hours		**18**

[1] *Excluding CSCE 100, CSCE 101L, CSCE 120, CSCE 220, or CSCE 320.*

[2] CSCE 101 *or* ENGR 101 *may be used to satisfy the Additional CSCE course requirement if taken at UNL prior to taking* CSCE 155, CSCE 156/CSCE 156H, *and* CSCE 311.

Minor in Computer Science – Raikes School Students

Eighteen (18) hours of computer science courses, including:

CSCE 183H / RAIK 183H	Honors: Computer Problem Solving Essentials	4
CSCE 184H / RAIK 184H	Honors: Software Development Essentials	4
SOFT 260H / RAIK 283H	Honors: Software Engineering III	4
Additional CSCE courses (or RAIK courses cross-listed as CSCE, including RAIK 284H) at the 200 level or above. [2][3]		6
Total Credit Hours		**18**

[2] *Except CSCE 235, CSCE 235H, and courses designated as not counting toward the minor (see CSCE course list in the catalog or the degree audit).*

[3] *No more than 3 hours for RAIK Design Studio courses RAIK 401H, RAIK 402H, RAIK 403H, RAIK 404H.*

Grade Rules

C- and D Grades

A grade of C or above is required for all courses in the major and minor, excluding ancillary courses.

Pass/No Pass

Up to 3 hours of Pass/No Pass CSCE coursework may be counted toward the minor.

Restriction

Students minoring in computer science may not declare a minor in informatics or software development. The computer science minor is not available to students majoring in computer engineering or software engineering.

CSCE 100 Introduction to Informatics
Prerequisites: Placement in to MATH 101 or higher
Notes: This course does not count towards a major or minor in Computer Science or a major in Computer Engineering or a major in Software Engineering.
Description: Introduction to the use of data-centric and information technologies-and issues and challenges-in today's applications in sciences, engineering, the humanities, and the arts. Exposure to computational thinking and programming, statistical thinking and research design, data analysis and database techniques, and visualization and creative thinking.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

CSCE 101 Fundamentals of Computer Science
Notes: A course in the science of computation suitable for prospective CSCE majors and for non-CSCE majors who desire a deeper understanding of computers and the work of computer scientists. This course may be used to satisfy a technical elective for Computer Science and Computer Engineering majors if taken at UNL prior to CSCE 155, CSCE 156, CSCE 310 and CSCE 361, or for Software Engineering majors, if taken at UNL prior to SOFT 160, SOFT 161, SOFT 260 and SOFT 261.
Description: Introduction to problem solving with computers. Problem analysis and specification, algorithm development, program design, and implementation in a high-level programming environment. Hardware, software, software engineering, networks, and impacts of computing on society.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: CIVE 201; CIVE 202; CSCE 101L
ACE: ACE 3 Math/Stat/Reasoning
Course and Laboratory Fee: $35

CSCE 101L Fundamentals of Computing Laboratory
Prerequisites: CSCE 101 or parallel.
Notes: This course does not count towards a major or minor in Computer Science or a major in Computer Engineering or a major in Software Engineering.
Description: A variety of computer oriented exercises using many software tools is presented which supplement and are coordinated with the topics taught in CSCE 101. Students are exposed to programming, operating systems, simulation software, spreadsheets, database software, the Internet, etc. Applications software introduced in the context of tools to explore the computer science topics and as alternatives to traditional programming languages. Emphasis on learning by experiment, with a goal of developing problem solving skills. A major component is the study of a programming language-the choice of which may vary by course section.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded with Option
Course and Laboratory Fee: $10

CSCE 120 Learning to Code
Prerequisites: Placement in to MATH 101 or higher
Notes: This course does not count towards a major or minor in Computer Science or a major in Computer Engineering or a major in Software Engineering. First course in a sequence for the minor in Software Development.
Description: Introduction to coding in the context of current web development technologies (JavaScript, HTML, CSS). Basic coding skills and an introduction to computing with an emphasis on processing data: data formatting and structure, data manipulation, data presentation and the basics of an interactive program.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: CSCE 220; CSCE 320

CSCE 155A Computer Science I
Prerequisites: MATH 102 or a Math Placement Test score for MATH 103 or higher.
Notes: Credit may be earned in only one CSCE 155 course. Recommended for students majoring in computer science or computer engineering.
Description: Introduction to problem solving with computers. Topics include problem solving methods, software development principles, computer programming, and computing in society.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: CSCE 156, ECEN 156; CSCE 156H; CSCE 235; CSCE 235H; CSCE 311; CSCE 352; ECEN 106; ECEN 123; ECEN 224; ECEN 478; MECH 300
ACE: ACE 3 Math/Stat/Reasoning
Course and Laboratory Fee: $35

CSCE 155E Computer Science I: Systems Engineering Focus
Crosslisted with: ECEN 155E
Prerequisites: MATH 102 or a Math Placement Test score for MATH 103 or higher.
Notes: Credit may be earned in only one CSCE 155 course. Recommended for students interested in systems engineering, such as operating systems, mobile computing, and embedded devices.
Description: Introduction to problem solving with computers. Topics include problem solving methods, software development principles, computer programming, and computing in society
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: CSCE 156, ECEN 156; CSCE 156H; CSCE 235; CSCE 235H; CSCE 311; CSCE 352; ECEN 106; ECEN 123; ECEN 220; ECEN 224; ECEN 478; MECH 300
ACE: ACE 3 Math/Stat/Reasoning
Course and Laboratory Fee: $10

CSCE 155H Honors: Computer Science I
Prerequisites: Good standing in UNL Honors Program; MATH 102 or a Math Placement Test score for MATH 103 or higher.
Notes: Covers the same topics as CSCE 155A, but in greater depth.
Description: Introduction to problem solving with computers. Topics include problem solving methods, software development principles, computer programming, and computing in society.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: CSCE 156, ECEN 156; CSCE 156H; CSCE 235; CSCE 235H; CSCE 311; CSCE 352; ECEN 106; ECEN 224; MECH 300
ACE: ACE 3 Math/Stat/Reasoning
Course and Laboratory Fee: $35

CSCE 155N Computer Science I: Engineering and Science Focus
Prerequisites: MATH 102 or a Math Placement Test score for MATH 103 or higher.
Notes: Recommended for students interested in numerical and graphical applications in engineering and science, such as applied physics, working with time-sequence data, and matrix applications.
Description: Introduction to problem solving with computers. Topics include problem solving methods, software development principles, computer programming, and computing in society.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: BSEN 311; CHME 312; CSCE 156, ECEN 156; CSCE 156H; CSCE 235; CSCE 235H; CSCE 311; ECEN 106; ECEN 224; ECEN 478; MECH 300; MECH 318; MECH 330; MECH 350; MECH 381
ACE: ACE 3 Math/Stat/Reasoning
Course and Laboratory Fee: $35

CSCE 155T Computer Science I: Informatics Focus
Prerequisites: MATH 102 or a Math Placement Test score for MATH 103 or higher.
Notes: Credit may be earned in only one CSCE 155 course. Recommended for students interested in data and information processing, such as library and database applications, online commerce, and bioinformatics.
Description: Introduction to computers and problem-solving with computers. Topics include problem solving methods, software development principles, computer programming, and computing in society.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: CSCE 156, ECEN 156; CSCE 156H; CSCE 235; CSCE 235H; CSCE 311; CSCE 352; ECEN 106; ECEN 224; MECH 300
ACE: ACE 3 Math/Stat/Reasoning

CSCE 156 Computer Science II
Crosslisted with: ECEN 156
Prerequisites: A grade of "P" or "C" or better in CSCE 155A, CSCE 155E, CSCE 155H, CSCE 155N, or CSCE 155T; coreq: MATH 106.
Notes: Laboratories supplement the lecture material and give an opportunity to practice concepts.
Description: Data structures, including linked lists, stacks, queues, and trees; algorithms, including searching, sorting, and recursion; programming language topics, including object-oriented programming; pointers, references, and memory management; design and implementation of a multilayer application with SQL database.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option
Offered: FALL/SPR
Prerequisite for: CSCE 235; CSCE 310; CSCE 310H; CSCE 322; CSCE 322H; CSCE 378; CSCE 378H; CSCE 453H, RAIK 453H; SOFT 162
Course and Laboratory Fee: $35

CSCE 156H Honors: Computer Science II
Prerequisites: Good standing UNL Honors Program. A grade of "P" or "C" or better in CSCE 155A, CSCE 155E, CSCE 155H, CSCE 155N, or CSCE 155T; Coreq: MATH 106.
Notes: Covers the same topics as CSCE 156, but in greater depth. Laboratories supplement the lecture material and give an opportunity to practice concepts.
Description: Data structures, including linked lists, stacks, queues, and trees; algorithms, including searching, sorting, and recursion; programming language topics, including object-oriented programming; pointers, references, and memory management; design and implementation of a multilayer application with SQL database.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded
Prerequisite for: CSCE 310; CSCE 310H; CSCE 322; CSCE 322H; CSCE 378; CSCE 378H; CSCE 453H, RAIK 453H; SOFT 162
Course and Laboratory Fee: $35

CSCE 163H Honors: Innovation Processes and Software Engineering Fundamentals
Crosslisted with: RAIK 163H
Prerequisites: Good standing in the University Honors Program; admission to the Jeffrey S. Raikes School of Computer Science and Management.
Description: Introduction to innovation processes for interdisciplinary and team-oriented problem solving of software engineering, business development, and industrial design problems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
Offered: FALL

CSCE 164 Introduction to Computer Engineering
Crosslisted with: ECEN 164
Notes: Project-based introduction to the computer engineering field.
Description: Introduction to basic concepts and skills needed in computer engineering. Practical application of basic computing concepts through an introduction to programming an embedded system.
Credit Hours: 2
Max credits per semester: 2
Max credits per degree: 2
Grading Option: Graded with Option
Offered: SPRING

CSCE 183H Honors: Computer Problem Solving Essentials
Crosslisted with: RAIK 183H
Prerequisites: Good standing in the University Honors Program; admission to the Jeffrey S. Raikes School of Computer Science and Management.
Description: Introduction to problem solving with computers. Problem analysis and specification, algorithm development, program design, and implementation. JAVA in a Windows platform.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded
Prerequisite for: CSCE 235; CSCE 235H; CSCE 352; ECON 215; RAIK 184H, CSCE 184H
ACE: ACE 3 Math/Stat/Reasoning

CSCE 184H Honors: Software Development Essentials
Crosslisted with: RAIK 184H
Prerequisites: Good standing in the University Honors Program; admission to the Jeffrey S. Raikes School of Computer Science and Management; and CSCE/RAIK 183H.
Description: Problem solving with computers. Problem analysis and specification, data structures, relational databases, algorithm development, and program design and implementation. Discrete mathematics topics, propositional and predicate logic, sets, relations, functions, and proof techniques. Software Development Principles.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded
Prerequisite for: BSAD 372H, RAIK 372H; CSCE 230; CSCE 231; CSCE 322; CSCE 322H; CSCE 378; CSCE 378H; CSCE 453H, RAIK 453H; SOFT 260H, RAIK 283H

CSCE 191 Special Topics in Computer Science
Prerequisites: Permission.
Notes: Will not count towards a major or minor in computer science and computer engineering. Topics will vary.
Description: Aspects of computers and computing at the freshman level for non-computer science and computer engineering majors and/or minors.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 6
Grading Option: Graded with Option
Course and Laboratory Fee: $10

CSCE 192 Special Topics in Computer Science
Prerequisites: Permission.
Description: Aspects of computers and computing for computer science and computer engineering majors and minors. Topics vary.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 6
Grading Option: Graded with Option

CSCE 194 Independent Study in Computing
Prerequisites: Freshmen standing; permission of the instructor.
Description: Independent study of computer science topics performed under the guidance of a member of the faculty in the Department of Computer Science and Engineering.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

CSCE 220 Software Development for Smart-Mobile Systems
Prerequisites: CSCE 120
Notes: This course does not count towards a major or minor in Computer Science or a major in Computer Engineering or a major in Software Engineering. Second course in a sequence for the minor in Software Development.
Description: Practical experience on building larger scale applications and familiarity with the tools, environments (e.g., Android or IoS), and requirements to develop software for current smart-mobile devices such as phones and tablets.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: CSCE 320; CSCE 453H, RAIK 453H

CSCE 230 Computer Organization
Prerequisites: A grade of 'P' or 'C' or better in CSCE 235, CSCE 235H, or RAIK 184H.
Notes: Laboratories supplement the lecture material and give an opportunity to practice concepts.
Description: Introduction to organization and structure of computer systems. Boolean logic, digital arithmetic, processor organization, machine language programming, input/output, memory organization, system support software, communication, and ethics.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option
Prerequisite for: CSCE 336; CSCE 351; ECEN 220; ECEN 370, CSCE 335
Course and Laboratory Fee: $20

CSCE 231 Computer Systems Engineering
Prerequisites: Grade of "P" or "C" or better in CSCE 235, CSCE 235H or RAIK 184H.
Description: Introduction to organization, structure, and applications of computer systems. Boolean Logic, Digital Arithmetic, Processor Organization, C Programming, Machine Language Programming, Input/Output, Memory Organization and Management, Building Embedded System Application.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option
Prerequisite for: CSCE 336; CSCE 351
Course and Laboratory Fee: $20

CSCE 235 Introduction to Discrete Structures
Prerequisites: A grade of 'P' or 'C' or better in CSCE 155A, CSCE 155E, CSCE 155H, CSCE 155N, CSCE 155T, SOFT 160, SOFT 160H or RAIK 183H; and MATH 106.
Notes: Theoretical concepts with programming assignments.
Description: Survey of elementary discrete mathematics. Elementary graph and tree theories, set theory, relations and functions, propositional and predicate logic, methods of proof, induction, recurrence relations, principles of counting, elementary combinatorics, and asymptotic notations.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: CSCE 230; CSCE 231; CSCE 310; CSCE 310H; SOFT 260
Course and Laboratory Fee: $20

CSCE 235H Honors: Introduction to Discrete Structures
Prerequisites: A grade of 'P' or 'C' or better in CSCE 155A, CSCE 155E, CSCE 155H, CSCE 155N, CSCE 155T, SOFT 160, SOFT 160H or RAIK 183H; and MATH 106.
Notes: Theoretical concepts with programming assignments. Covers the same topics as CSCE 235, but in greater depth.
Description: Survey of elementary discrete mathematics. Elementary graph and tree theories, set theory, relations and functions, propositional and predicate logic, methods of proof, induction, recurrence relations, principles of counting, elementary combinatorics, and asymptotic notations.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: CSCE 230; CSCE 231; CSCE 310; SOFT 260
Course and Laboratory Fee: $20

CSCE 251 Unix Programming Environment
Notes: Familiarity with at least one high-level programming language.
Description: Introduction to the Unix operating system. Unix file system. Unix tools and utilities. Shell programming.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded with Option
Course and Laboratory Fee: $25

CSCE 291 Special Topics in Computer Science
Prerequisites: Permission.
Notes: Will not count towards a major or minor in computer science and computer engineering. Topics vary.
Description: Aspects of computers and computing for non-computer science and computer engineering majors and/or minors.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 6
Grading Option: Graded with Option

CSCE 292 Special Topics in Computer Science
Prerequisites: Permission.
Description: Aspects of computers and computing for computer science and computer engineering majors and minors. Topics vary.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 6
Grading Option: Graded with Option

CSCE 294 Independent Study in Computing
Prerequisites: Sophomore standing; permission of the instructor.
Description: Independent study of computer science topics performed under the guidance of a member of the faculty in the Department of Computer Science and Engineering.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

CSCE 310 Data Structures and Algorithms
Prerequisites: Grades of "Pass" or "C" or better in CSCE 156/156H or SOFT 161 and CSCE 235/235H.
Notes: Theoretical concepts with programming assignments.
Description: A review of algorithm analysis, asymptotic notation, and solving recurrence relations. Advanced data structures and their associated algorithms, heaps, priority queues, hash tables, trees, binary search trees, and graphs. Algorithmic techniques, divide and conquer, transform and conquer, space-time trade-offs, greedy algorithms, dynamic programming, randomization, and distributed algorithms. Introduction to computability and NP-completeness.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: CSCE 351; CSCE 360; CSCE 361, CSCE 361H; CSCE 493
Course and Laboratory Fee: $20

CSCE 310H Honors: Data Structures and Algorithms
Prerequisites: Good Standing in UNL Honors Program or by invitation; grades of 'P' or 'C' or better in CSCE 156/156H or SOFT 161 and CSCE 235/235H.
Description: CSCE 310H covers the same topics as CSCE 310, but in greater depth. For course description, see CSCE 310.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
Prerequisite for: CSCE 351; CSCE 360; CSCE 493
Course and Laboratory Fee: $20

CSCE 311 Data Structures and Algorithms for Informatics
Prerequisites: Grade of "Pass" or "C" or better in CSCE 155A, CSCE 155E, CSCE 155H, CSCE 155N, CSCE 155T, CSCE 320, or SOFT 160.
Notes: CSE majors must take CSCE 310. Students may not receive credit for both CSCE 310 and 311.
Description: An introduction to algorithms and data structures for informatics. Foundational coverage of algorithms includes both problems (such as indexing, searching, sorting, and pattern matching) and methods (such as greedy, divide-and-conquer, and dynamic programming). Foundational coverage of data structures includes lists, tables, relational databases, regular expressions, trees, graphs, and multidimensional arrays. The topics will be studied in the context of informatics applications.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: CSCE 322; CSCE 322H; CSCE 351; CSCE 360; CSCE 361, CSCE 361H; CSCE 378; CSCE 378H; CSCE 386; CSCE 453H, RAIK 453H; CSCE 484; CSCE 493; CSCE 493A

CSCE 320 Data Analysis
Prerequisites: A grade of "P" or "C" or better in CSCE 120 or CSCE 220.
Notes: This course does not count towards a major or minor in Computer Science or a major in Computer Engineering or a major in Software Engineering. Third course in a sequence for the minor in Software Development.
Description: Practical experience on how to model data through existing techniques including object-oriented and relational models. These models can then be used at the center of systems to promote efficient and effective data processing and analysis.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: CSCE 311; CSCE 493

CSCE 322 Programming Language Concepts
Prerequisites: A grade of "P" or "C" or better in CSCE 156, CSCE 156H, CSCE 311, SOFT 161, SOFT 161H, or RAIK 184H.
Description: List-processing, string-processing, and other types of high-level programming languages. Fundamental concepts of data types, control structures, operations, and programming environments of various programming languages. Analysis, formal specification, and comparison of language features.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Course and Laboratory Fee: $40

CSCE 322H Honors: Programming Language Concepts
Prerequisites: Good Standing in UNL Honors Program or by invitation; A grade of "P" or "C" or better in CSCE 156, CSCE 156H, CSCE 311, SOFT 161, SOFT 161H, or RAIK 184H.
Description: List-processing, string-processing, and other types of high-level programming languages. Fundamental concepts of data types, control structures, operations, and programming environments of various programming languages. Analysis, formal specification, and comparison of language features.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: FALL/SPR

CSCE 335 Digital Logic Design
Crosslisted with: ECEN 370
Prerequisites: ECEN 103 or CSCE 230
Description: Combinational and sequential logic circuits. MSI chips, programmable logic devices (PAL, ROM, PLA) used to design combinational and sequential circuits. CAD tools. LSI and PLD components and their use. Hardware design experience.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
Prerequisite for: ECEN 307; ECEN 494

CSCE 336 Embedded Systems
Prerequisites: A grade of "P" or "C" or better in CSCE 230 or CSCE 231.
Description: Introduction to designing, interfacing, configuring, and programming embedded systems. Configure simple embedded microprocessor systems, control peripherals, write device drivers in a high-level language, set up embedded and real-time operating systems, and develop applications for embedded systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: CSCE 488; CSCE 488H
Course and Laboratory Fee: $40

CSCE 351 Operating System Kernels
Prerequisites: A grade of "P" or "C" or better in CSCE 230 or CSCE 231 and CSCE 310, CSCE 310H, CSCE 311, SOFT 260, SOFT 260H or RAIK 283H.
Description: Design and implementation of operating system kernels. Bootstrapping and system initialization, process context switching, I/O hardware and software, DMA, I/O polling, interrupt handlers, device drivers, clock management. Substantial programming implementing or extending an instructional operating system kernel.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Course and Laboratory Fee: $40

CSCE 352 Exploring Virtual Reality
Prerequisites: CSCE 155A/155E/155T/155H, SOFT 160, RAIK 183H, or equivalent.
Notes: Requires familiarity with a high-level programming language .
Description: Introduction to designing, developing and producing virtual reality and immersive experiences. Work in interdisciplinary teams to produce a virtual reality/immersive project, game or storytelling experience.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

CSCE 360 Software Security in Practice
Prerequisites: A grade of "P" or "C" or higher in CSCE 310, CSCE 310H, CSCE 311, SOFT 260, SOFT 260H, or RAIK 283H
Description: Introduction to web application security risks and associated mitigation strategies, along with cloud-based resource management, and security basics on cloud application hosting.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

CSCE 361 Software Engineering
Crosslisted with: CSCE 361H
Prerequisites: A grade of "P" or "C" or better in CSCE 310, CSCE 310H, CSCE 311, SOFT 260, SOFT 260H or RAIK 283H.
Notes: Requires participation in a group design and implementation of a software project.
Description: Techniques used in the disciplined development of large software projects. Software requirements analysis and specifications, program design, coding and integration testing, and software maintenance. Software estimation techniques, design tools, and complexity metrics.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: CSCE 461, CSCE 861, SOFT 461; CSCE 486; CSCE 486H; CSCE 488; CSCE 488H
Course and Laboratory Fee: $20

CSCE 361H Software Engineering
Crosslisted with: CSCE 361
Prerequisites: Good Standing in UNL Honors Program or by invitation; A grade of "P" or "C" or better in CSCE 310, CSCE 310H, CSCE 311, SOFT 260, SOFT 260H or RAIK 283H.
Notes: Requires participation in a group design and implementation of a software project.
Description: Techniques used in the disciplined development of large software projects. Software requirements analysis and specifications, program design, coding and integration testing, and software maintenance. Software estimation techniques, design tools, and complexity metrics.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: CSCE 461, CSCE 861, SOFT 461; CSCE 486; CSCE 486H; CSCE 488; CSCE 488H
Course and Laboratory Fee: $20

CSCE 370H Honors: Data and Models II: Data Science Fundamentals
Crosslisted with: RAIK 370H
Prerequisites: Good standing in the University Honors Program or by invitation; admission to the Jeffrey S.Raikes School of Computer Science and Management; and RAIK 270H
Description: Introduction to approaches using data for prediction and learning. Exploration of data for linear and nonlinear data modeling, machine learning, and supportive methods from statistics and numerical methods.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: FALL/SPR

CSCE 378 Human-Computer Interaction
Prerequisites: A grade of "P" or "C" or better in CSCE 156, CSCE 156H, SOFT 161, SOFT 161H, RAIK 184H or CSCE 311.
Notes: STAT 380 or ECEN 305 recommended. Meeting ACE 1 and ACE 2 requirements prior to taking this course recommended.
Description: Knowledge and techniques useful in the design of computing systems for human use. Includes models of HCI, human information processing characteristics important in HCI, computer system features, such as input and output devices, dialogue techniques, and information presentation, task analysis, prototyping and the iterative design cycle, user interface implementation, interface evaluation.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Course and Laboratory Fee: $20

CSCE 378H Honors: Human-Computer Interaction
Prerequisites: Good standing in the University Honors Program; A grade of "P" or "C" or better in CSCE 156, CSCE 156H, SOFT 161, SOFT 161H, RAIK 184H or CSCE 311.
Notes: STAT 380/RAIK 270H or ECEN 305 recommended. Meeting ACE 1 and ACE 2 requirements prior to taking this course recommended.
Description: Knowledge and techniques useful in the design of computing systems for human use. Includes models of HCI, human information processing characteristics important in HCI, computer system features, such as input and output devices, dialogue techniques, and information presentation, task analysis, prototyping and the iterative design cycle, user interface implementation, interface evaluation.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

CSCE 386 Practice and Professional Development: Design and Implementation
Prerequisites: Grade of "Pass" or "C" in CSCE 311.
Description: Studies in data science practice and professional development. Data science topics include data-centric and model-driven approaches; information and knowledge structures, organization, and access; searching and mining; and visualization. Professional development involves instruction in career development, entrepreneurship, professional ethics, and professional communications.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: FALL

CSCE 391 Special Topics in Computer Science
Prerequisites: Permission.
Description: Aspects of computers and computing for non-computer science and computer engineering majors and/or minors. Topics vary.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 6
Grading Option: Graded with Option

CSCE 392 Special Topics in Computer Science
Prerequisites: Permission.
Description: Aspects of computers and computing for computer science and computer engineering majors and minors. Topics vary.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 6
Grading Option: Graded with Option

CSCE 394 Independent Study in Computing
Prerequisites: Junior standing; permission of the instructor.
Description: Independent study of computer science topics performed under the guidance of a member of the faculty in the Department of Computer Science and Engineering.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

CSCE 399 Undergraduate Thesis
Prerequisites: Permission.
Description: Independent practice and research leading to a thesis.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 6
Grading Option: Graded

CSCE 399H Honors Undergraduate Thesis
Prerequisites: Permission.
Description: Independent practice and research leading to a thesis.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 6
Grading Option: Graded

CSCE 401H Honors: RAIK Design Studio I
Crosslisted with: RAIK 401H, BSAD 401H, SOFT 401H
Prerequisites: Good standing in the University Honors Program or by invitation; admission to the Jeffrey S. Raikes School of Computer Science and Management; RAIK 284H/SOFT 261H or equivalent.
Notes: First semester in the Jeffrey S. Raikes School of Computer Science and Management design studio
Description: Application of Raikes School core content in a team oriented, project management setting. Complete projects in consultation with private and public sector clients.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
Offered: FALL
Prerequisite for: RAIK 402H, BSAD 402H, CSCE 402H, SOFT 402H
ACE: ACE 8 Civic/Ethics/Stewardship
Experiential Learning: Case/Project-Based Learning

CSCE 402H Honors: RAIK Design Studio II
Crosslisted with: RAIK 402H, BSAD 402H, SOFT 402H
Prerequisites: Good standing in the University Honors Program or by invitation; admission to the Jeffrey S. Raikes School of Computer Science and Management; BSAD/CSCE/SOFT/RAIK 401H.
Notes: Second semester in the Jeffrey S. Raikes School of Computer Science and Management design studio
Description: Application of Raikes School core content in a team oriented, project management setting. Complete projects in consultation with private and public sector clients.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
Offered: SPRING
Prerequisite for: RAIK 403H, BSAD 403H, CSCE 403H
ACE: ACE 10 Integrated Product
Experiential Learning: Case/Project-Based Learning

CSCE 403H Honors: RAIK Design Studio III
Crosslisted with: RAIK 403H, BSAD 403H
Prerequisites: Good standing in the University Honors Program or by invitation; admission to the Jeffrey S. Raikes School of Computer Science and Management; BSAD/CSCE/SOFT/RAIK 402H.
Notes: Third semester of Jeffrey S. Raikes School of Computer Science and Management design studio sequence.
Description: Application of Jeffrey S. Raikes School of Computer Science and Management core content in a team oriented, project management setting. Complete projects in consultation with private and public sector clients.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
Prerequisite for: RAIK 404H, BSAD 404H, CSCE 404H
Experiential Learning: Case/Project-Based Learning

CSCE 404H Honors: RAIK Design Studio IV
Crosslisted with: RAIK 404H, BSAD 404H
Prerequisites: Good standing in the University Honors Program or by invitation; admission to the Jeffrey S. Raikes School of Computer Science and Management; and BSAD/CSCE/SOFT/RAIK 403H.
Notes: Fourth semester in the Jeffrey S. Raikes School of Computer Science and Management design studio sequence.
Description: Application of Raikes School core content in a team oriented, project management setting. Complete projects in consultation with private and public sector clients.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
Experiential Learning: Case/Project-Based Learning

CSCE 405H Honors: RAIK Research Studio I
Crosslisted with: RAIK 405H
Prerequisites: Good standing in the University Honors Program or by invitation; admission to the Jeffrey S. Raikes School of Computer Science and Management; RAIK 284H/SOFT 261H or equivalent.
Notes: First semester of Jeffrey S. Raikes School of Computer Science and Management research studio experience. Students work individually with a sponsoring faculty member from the area of their research and Raikes School faculty.
Description: Application of research principles to solve complex problems through the delivery of innovative, cutting-edge solutions and to gain an understanding of the roles involved.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
Offered: FALL
Prerequisite for: CSCE 406H, RAIK 406H

CSCE 406H Honors: RAIK Research Studio II
Crosslisted with: RAIK 406H
Prerequisites: RAIK 405H
Notes: Second semester of Jeffrey S. Raikes School of Computer Science and Management research studio experience. Students work individually with a sponsoring faculty member from the area of their research and Raikes School faculty.
Description: Application of research principles to solve complex problems through the delivery of innovative, cutting-edge solutions and to gain an understanding of the roles involved.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
Offered: SPRING

CSCE 410 Information Retrieval Systems
Crosslisted with: CSCE 810
Prerequisites: A grade of "P" or "C" or better in CSCE 310, CSCE 310H, CSCE 311, SOFT 260, SOFT 260H or RAIK 283H.
Description: Outline of the general information retrieval problem, functional overview of information retrieval. Deterministic models of information retrieval systems; conventional Boolean, fuzzy set theory, p-norm, and vector space models. Probabilistic models. Text analysis and automatic indexing. Automatic query formulation. System-user adaptation and learning mechanisms. Intelligent information retrieval. Retrieval evaluation. Review of new theories and future directions. Practical experience with a working experimental information retrieval system.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: SPRING

CSCE 411 Data Modeling for Systems Development
Crosslisted with: CSCE 811
Prerequisites: A grade of "P" or "C" or better in CSCE 310, CSCE 310H, CSCE 311, SOFT 260, SOFT 260H or RAIK 283H.
Description: Concepts of relational and object-oriented data modeling through the process of data model development including conceptual, logical and physical modeling. Techniques for identifying and creating relationships between discrete data members, reasoning about how data modeling and analysis are incorporated in system design and development, and specification paradigms for data models. Common tools and technologies for engineering systems and frameworks for integrating data. Design and analysis of algorithms and techniques for identification and exploration of data relationships, such as Bayesian probability and statistics, clustering, map-reduce, and web-based visualization.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

CSCE 412 Data Visualization
Crosslisted with: CSCE 812
Prerequisites: A grade of "P" or "C" or better in CSCE 310, CSCE 310H, CSCE 311, SOFT 260, SOFT 260H or RAIK 283H; MATH 314.
Description: Fundamentals and implementations of data visualization techniques. Programming skills and practices in interactive visualization applications. Visualization foundations, human perception for information processing, and visualization techniques for different data types, such as scalar-field data, vector-field data, geospatial data, multivariate data, graph/network data, and text/document data. Advanced visualization algorithms and topics as time permits.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: FALL/SPR

CSCE 413 Database Systems
Crosslisted with: CSCE 813
Prerequisites: A grade of "P" or "C" or better in CSCE 310, CSCE 310H, CSCE 311, SOFT 260, SOFT 260H or RAIK 283H.
Notes: Involves practical experience with a working database system.
Description: Data and storage models for database systems; entity/relationship, relational, and constraint models; relational databases; relational algebra and calculus; structured query language; Logical database design: normalization; integrity; distributed data storage; concurrency; security issues. Spatial databases and geographic information systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: CSCE 913; CSCE 914
Course and Laboratory Fee: $40

CSCE 421 Foundations of Constraint Processing
Crosslisted with: CSCE 821
Prerequisites: A grade of "P" or "C" or better in CSCE 235 and CSCE 310, CSCE 310H, CSCE 311, SOFT 260, SOFT 260H or RAIK 283H.
Description: Constraint processing for articulating and solving industrial problems such as design, scheduling, and resource allocation. The foundations of constraint satisfaction, its basic mechanisms (e.g., search, backtracking, and consistency-checking algorithms), and constraint programming languages. New directions in the field, such as strategies for decomposition and for symmetry identification.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: CSCE 921
Course and Laboratory Fee: $10

CSCE 423 Design and Analysis of Algorithms
Crosslisted with: CSCE 823
Prerequisites: A grade of "P" or "C" or better in CSCE 310, CSCE 310H, CSCE 311, SOFT 260, SOFT 260H or RAIK 283H.
Description: Mathematical preliminaries. Strategies for algorithm design, including divide-and-conquer, greedy, dynamic programming and backtracking. Mathematical analysis of algorithms. Introduction to NP-Completeness theory, including the classes P and NP, polynomial transformations and NP-complete problems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: CSCE 923; CSCE 924
Course and Laboratory Fee: $20

CSCE 424 Computational Complexity Theory
Crosslisted with: CSCE 824
Prerequisites: A grade of "P" or "C" or better in CSCE 310, CSCE 310H, CSCE 311, SOFT 260, SOFT 260H or RAIK 283H.
Description: Turing machine model of computation: deterministic, nondeterministic, alternating, probabilistic. Complexity classes: Time and space bounded, deterministic, nondeterministic, probabilistic. Reductions and completeness. Complexity of counting problems. Non-uniformity. Lower bounds. Interactive proofs.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

CSCE 425 Compiler Construction
Crosslisted with: CSCE 825
Prerequisites: A grade of "P" or "C" or better in CSCE 310, CSCE 310H, CSCE 311, SOFT 260, SOFT 260H or RAIK 283H.
Description: Review of program language structures, translation, loading, execution, and storage allocation. Compilation of simple expressions and statements. Organization of a compiler including compile-time and run-time symbol tables, lexical scan, syntax scan, object code generation, error diagnostics, object code optimization techniques, and overall design.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Course and Laboratory Fee: $20

CSCE 428 Automata, Computation, and Formal Languages
Crosslisted with: CSCE 828
Prerequisites: A grade of "P" or "C" or better in CSCE 310, CSCE 310H, CSCE 311, SOFT 260, SOFT 260H or RAIK 283H.
Description: Introduction to the classical theory of computer science. Finite state automata and regular languages, minimization of automata. Context free languages and pushdown automata, Turing machines and other models of computation, undecidable problems, introduction to computational complexity.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Course and Laboratory Fee: $20

CSCE 430 Computer Architecture
Crosslisted with: CSCE 830
Prerequisites: A grade of "P" or "C" or better in CSCE 310, CSCE 310H, CSCE 311, SOFT 260, SOFT 260H or RAIK 283H; Coreq: STAT 380, ECEN 305 or RAIK 270H.
Description: Architecture of single-processor (Von Neumann or SISD) computer systems. Evolution, design, implementation, and evaluation of state-of-the-art systems. Memory Systems, including interleaving, hierarchies, virtual memory and cache implementations; Communications and I/O, including bus architectures, arbitration, I/O processors and DMA channels; and Central Processor Architectures, including RISC and Stack machines, high-speed arithmetic, fetch/execute overlap, and parallelism in a single-processor system.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Course and Laboratory Fee: $20

CSCE 431 Hardware and Software Acceleration for Machine Learning
Crosslisted with: CSCE 831
Prerequisites: A grade of "P" or "C" or better in CSCE 230 or CSCE 231 and CSCE 310, CSCE 310H, CSCE 311, SOFT 260, SOFT 260H or RAIK 283H.
Description: Overview of the hardware and software acceleration techniques, including basics of deep learning, deep learning frameworks, hardware accelerators, co-optimization of algorithms and hardware, training and inference, support for state-of-the-art deep learning networks.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: FALL

CSCE 435 Cluster and Grid Computing
Crosslisted with: CSCE 835
Prerequisites: A grade of "P" or "C" or better in CSCE 310, CSCE 310H, CSCE 311, SOFT 260, SOFT 260H, or RAIK 283H.
Notes: Designed for CSCE and non-CSCE students who have an interest in building or programming clusters to enhance their computationally-intense research.
Description: Build and program clusters. Cluster construction, cluster administration, cluster programming, and grid computing.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

CSCE 436 Advanced Embedded Systems
Crosslisted with: CSCE 836
Prerequisites: A grade of "P" or "C" or better in CSCE 231, CSCE 336 or ECEN 220.
Description: Embedded hardware design techniques; transceiver design and low-power communication techniques; sensors and distributed sampling techniques; embedded software design and embedded operating systems; driver development; embedded debugging techniques;hardware and software architectures of embedded systems; and design, development, and implementation of embedded applications.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Course and Laboratory Fee: $40

CSCE 438 Internet of Things
Crosslisted with: CSCE 838
Prerequisites: CSCE 230 or CSCE 231; SOFT 260, CSCE 310, CSCE 310H, CSCE 311 or equivalent; senior or graduate standing or instructor permission.
Description: Theoretical and practical insight into the Internet of Things (IoT). Basics of IoT, including devices and sensors, connectivity, cloud processing and storage, analytics and machine learning, security, business models as well as advanced topics such as localization, synchronization, connected vehicles, and applications of IoT. Includes a group project that provides hands-on interaction with IoT.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Course and Laboratory Fee: $20

CSCE 439 Robotics: Algorithms and Applications
Crosslisted with: CSCE 839
Prerequisites: A grade of "P" or "C" or better in CSCE 231, CSCE 336 or ECEN 220 and CSCE 310, CSCE 310H, CSCE 311, SOFT 260, SOFT 260H or RAIK 283H
Description: Fundamental theory and algorithms for real world robot systems. Design and build a robot platform and implement algorithms in C++ or other high level languages. Topics include: open and closed loop control, reactive control, localization, navigation, path planning, obstacle avoidance, dynamics, kinematics, manipulation and grasping, sensing, robot vision processing, and data fusion.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: FALL/SPR
Course and Laboratory Fee: $50

CSCE 440 Numerical Analysis I
Crosslisted with: CSCE 840, MATH 440, MATH 840
Prerequisites: CSCE 155A, CSCE 155E, CSCE 155H, CSCE 155N, CSCE 155T, or SOFT 160; MATH 107.
Notes: Credit toward the degree may be earned in only one of the following: CSCE/MATH 440/840 and MECH 480/880.
Description: Principles of numerical computing and error analysis covering numerical error, root finding, systems of equations, interpolation, numerical differentiation and integration, and differential equations. Modeling real-world engineering problems on digital computers. Effects of floating point arithmetic.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: CSCE 942
Course and Laboratory Fee: $20

CSCE 443 Cybersecurity for Big Data, Cloud and Cryptocurrencies
Crosslisted with: CSCE 843
Prerequisites: A grade of "P" or "C" or better in CSCE 310, CSCE 310H, CSCE 311, SOFT 260, SOFT 260H or RAIK 283H.
Notes: Labs will be conducted on academic cloud and compute environments as well as public clouds.
Description: Covers the cybersecurity threat landscape and the mitigation strategies for Big Data, Cloud environments and Cryptocurrencies. Discusses emerging technologies and frameworks such as End-to-end encryption, Blockchains, Smart Contracts, OpenID Connect and OAuth2.0 as promising solutions to ensure data confidentiality and privacy.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: FALL

CSCE 451 Operating Systems Principles
Crosslisted with: CSCE 851
Prerequisites: A grade of "P" or "C" or better in CSCE 230 or CSCE 231 and CSCE 310, CSCE 310H, CSCE 311, SOFT 260, SOFT 260H or RAIK 283H.
Description: Organization and structure of operating systems. Control, communication, and synchronization of concurrent processes. Processor and job scheduling. Memory organization and management including paging, segmentation, and virtual memory. Resource management. Deadlock avoidance, detection, recovery. File system concepts and structure. Protection and security. Substantial programming.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: CSCE 455, CSCE 855
Course and Laboratory Fee: $20

CSCE 453H Honors: User Interfaces
Crosslisted with: RAIK 453H
Prerequisites: A grade of "P" or "C+" or higher in CSCE 156, CSCE 156H, CSCE 220, CSCE 311, RAIK 184H, SOFT 161, or SOFT 161H. Good standing in the University Honors Program.
Notes: Enrolled students are expected to have advanced communication skills and a high commitment to conscientiousness. Students who are not in the University Honors Program but nonetheless meet these requirements may request permission of the instructor to enroll. Meeting ACE1 and ACE2 requirements prior to taking this course is recommended.
Description: Introduction to the areas of user interfaces and user experience through reading and hands-on experiences. Areas covered include the psychology and physiology of design, the process of interface design, cultural values and accessibility, designing for beauty and delight, and dynamic evaluation strategies.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

CSCE 454 Human-Robot Interaction
Crosslisted with: CSCE 854
Prerequisites: A grade of "P" or "C" or better in CSCE 156, CSCE 156H, SOFT 161, SOFT 161H, RAIK 184H or CSCE 311.
Notes: Meeting ACE1 and ACE2 requirements prior to taking this course is recommended. Non-CSCE majors may discuss qualifications with the instructor.
Description: Introduction to the area of human-robot interaction through the reading and discussion of current peer-reviewed articles on topic to include teleoperation, social robotics, and open questions with field-based or aerial robotic systems. Areas covered include: research methods, experimental design, and identification of problems/open questions.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: FALL/SPR

CSCE 455 Distributed Operating Systems
Crosslisted with: CSCE 855
Prerequisites: CSCE 451/851.
Description: Organization and structure of distributed operating systems. Control, communication and synchronization of concurrent processes in the context of distributed systems. Processor allocation and scheduling. Deadlock avoidance, detection, recovery in distributed systems. Fault tolerance. Distributed file system concepts and structure.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: CHME 496, CHME 896
Course and Laboratory Fee: $20

CSCE 456 Parallel Programming
Crosslisted with: CSCE 856
Prerequisites: A grade of "P" or "C" or better in CSCE 310, CSCE 310H, CSCE 311, SOFT 260, SOFT 260H, or RAIK 283H.
Description: Introduction to the fundamentals of parallel computation and applied algorithm design. Methods and models of modern parallel computation; general techniques for designing efficient parallel algorithms for distributed and shared memory multiprocessor machines; principles and practice in programming an existing parallel machine.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Course and Laboratory Fee: $10

CSCE 457 Systems Administration
Crosslisted with: CSCE 857
Prerequisites: A grade of "P" or "C" or better in CSCE 310, CSCE 310H, CSCE 311, SOFT 260, SOFT 260H or RAIK 283H.
Description: Introduction to basic concepts of system administration. Operating systems and networking overview. User and resource management. Networking, systems and internet related security. System services and common applications, web services, database services, and mail servers. Basic scripting in shell, Perl, and Expect. Systems administration on UNIX® platform.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

CSCE 458 Molecular and Nanoscale Communication
Crosslisted with: CSCE 858
Prerequisites: A grade of "P" or "C" or better in CSCE 310, CSCE 310H, CSCE 311, SOFT 260, SOFT 260H or RAIK 283H; STAT 380, ECEN 305 or RAIK 270H.
Notes: Completing CSCE 462/862 and CSCE 465/865 prior to taking this course is recommended. Exceptions can be granted on a per-student basis by the instructor.
Description: Overview of nanoscale communication options. Focus on bio-inspired communication through molecule exchange and biochemical reactions. Different techniques to realize nanomachines will be surveyed in the course, with particular attention to the tools provided by synthetic biology for the programming of biological cooperative systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: FALL/SPR

CSCE 459 Genetically Engineered Systems
Crosslisted with: CSCE 859
Prerequisites: A grade of "P" or "C" or better in CSCE 310, CSCE 310H, CSCE 311, SOFT 260, SOFT 260H or RAIK 283H; STAT 380, ECEN 305 or RAIK 270H.
Notes: Completing CSCE/MATH 440/840, MATH 439/839, and CSCE 471/871 prior to taking this course is recommended. Exceptions can be granted on a per-student basis by the instructor. Meeting ACE 1 and ACE 2 requirements prior to taking this course is recommended. Non-CSCE majors may discuss qualifications with the instructor.
Description: Introduction to the field of synthetic biology, and its interdisciplinary foundational concepts. Presents the technologies at the basis of synthetic biology, together with the engineering concepts that underlie the design, modeling, and realization of genetically engineered systems. Surveys examples of cutting edge applications.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: FALL/SPR

CSCE 460 Software Engineering for Robotics
Crosslisted with: SOFT 460, CSCE 860
Prerequisites: SOFT 261 or RAIK 284H or CSCE 361
Description: Application of software engineering practices and principles to autonomous robotic systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
Offered: FALL

CSCE 461 Advanced Topics in Software Engineering
Crosslisted with: CSCE 861, SOFT 461
Prerequisites: A grade of "P" or "C" or better in CSCE 361, CSCE 361H, SOFT 261, SOFT 261H or RAIK 284H.
Description: Advanced or emerging techniques in software engineering. Topics include but not limited to design methodology, software dependability, and advanced software development environments.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

CSCE 462 Communication Networks
Crosslisted with: CSCE 862
Prerequisites: A grade of "P" or "C" or better in CSCE 310, CSCE 310H, CSCE 311, SOFT 260, SOFT 260H or RAIK 283H; STAT 380, ECEN 305 or RAIK 270H.
Description: Introduction to the architecture of communication networks and the rudiments of performance modeling. Circuit switching, packet switching, hybrid switching, protocols, local and metro area networks, wide area networks and the Internet, elements of performance modeling, and network programming. Network security, asynchronous transfer mode (ATM), optical, wireless, cellular, and satellite networks, and their performance studies.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: CSCE 952; CSCE 953
Course and Laboratory Fee: $20

CSCE 463 Data and Network Security
Crosslisted with: CSCE 863
Prerequisites: A grade of "P" or "C" or better in CSCE 310, CSCE 310H, CSCE 311, SOFT 260, SOFT 260H or RAIK 283H.
Description: Concepts and principles of data and network security. Focuses on practical aspects and application of crypto systems in security protocols for networks such as the Internet. Topics include: applications of cryptography and cryptosystems for digital signatures, authentication, network security protocols for wired and wireless networks, cyberattacks and countermeasures, and security in modern computing platforms.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

CSCE 464 Internet Systems and Programming
Crosslisted with: CSCE 864
Prerequisites: A grade of "Pass" or C or better in CSCE 156, SOFT 161, RAIK 184H or CSCE 311 or equivalent programming experience.
Notes: A grade of "Pass" or C or better in CSCE 156, SOFT 161, RAIK 184H or CSCE 311 or equivalent programming experience.
Description: Paradigms, systems, and languages for Internet applications. Client-side and server-side programming, object-based and event-based distributed programming, and multi-tier applications. Coverage of specific technologies varies.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

CSCE 465 Wireless Communication Networks
Crosslisted with: CSCE 865
Prerequisites: A grade of "P" or "C" or better in STAT 380, ECEN 305 or RAIK 270H
Description: Discussion of theoretical and practical insight to wireless communications and wireless networking, current practices, and future trends. Wireless network architectures, mobility management, radio propagation, modulation, power control, antennas, channel access, pricing, and standards.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: CSCE 954

CSCE 466 Software Design and Architecture
Crosslisted with: SOFT 466, CSCE 866
Prerequisites: A grade of "P" or "C" or better in CSCE 361, CSCE 361H, SOFT 261, SOFT 261H or RAIK 284H.
Notes: Letter grade only.
Description: Introduction to the concepts, principles, and state-of-the-art methods in software design and architecture. Topics include application of software engineering process models and management approaches for the design and architecture of large-scale software systems, trade-offs of designing for qualities such as performance, security, and dependability, and techniques and tools for analyzing and evaluating software architectures.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded

CSCE 467 Testing, Verification and Analysis
Crosslisted with: SOFT 467, CSCE 867
Prerequisites: A grade of "P" or "C" or better in CSCE 361, CSCE 361H, SOFT 261, SOFT 261H or RAIK 284H.
Notes: Letter grade only.
Description: In-depth coverage of problems related to software quality, and approaches for addressing them. Topics include testing techniques, dynamic and static program analysis techniques, and other approaches for verifying software qualities. Tool support for performing testing, verification, and analysis will also be studied.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
Course and Laboratory Fee: $20

CSCE 468 Requirements Elicitation, Modeling and Analysis
Crosslisted with: SOFT 468, CSCE 868
Prerequisites: A grade of "P" or "C" or better in CSCE 361, CSCE 361H, SOFT 261, SOFT 261H or RAIK 284.
Notes: Letter grade only.
Description: In-depth coverage of processes, methods and techniques for determining, or deciding, what a proposed software system should do. Topics include the requirements engineering process, identification of stakeholders, requirements elicitation techniques, methods for informal and formal requirements documentation, techniques for analyzing requirements models for consistency and completeness, and traceability of requirements across system development and evolution. Tool support for modeling functional and non-functional requirements to support elicitation and analysis will be studied.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded

CSCE 469 Secure Software Engineering
Crosslisted with: SOFT 469, CSCE 869
Prerequisites: SOFT 261, CSCE 361, RAIK 284H, or graduate standing.
Description: Introduction to concepts, principles and state-of-the-art methods in creating and maintaining secure software systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

CSCE 470 Computer Graphics
Crosslisted with: CSCE 870
Prerequisites: A grade of "P" or "C" or better in CSCE 310, CSCE 310H, CSCE 311, SOFT 260, SOFT 260H or RAIK 283H; MATH 314
Description: Display and recording devices; incremental plotters; point, vector, and character generation; grey scale displays, digitizers and scanners, digital image storage; interactive and passive graphics; pattern recognition; data structures and graphics software; the mathematics of three dimensions; homogeneous coordinates; projections and the hidden-line problem.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Course and Laboratory Fee: $20

CSCE 471 Computational Methods in Bioinformatics
Crosslisted with: CSCE 871
Prerequisites: A grade of "P" or "C" or better in CSCE 310, CSCE 310H, CSCE 311, SOFT 260, SOFT 260H or RAIK 283H.
Description: Introduction to computational methods for tackling challenges in biological data analysis and modeling and understanding complex systems at the molecular and cellular level. The main topics include bio-sequence analysis, motif finding, structure prediction, phylogenic inference, regulation network modeling, and high-throughput omics data analysis.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: SPRING
Prerequisite for: CSCE 971

CSCE 472 Digital Image Processing
Crosslisted with: CSCE 872
Prerequisites: A grade of "Pass" or C or better in CSCE 156, SOFT 161, RAIK 184H or CSCE 311 or equivalent programming experience.
Notes: A grade of "Pass" or C or better in CSCE 156, SOFT 161, RAIK 184H or CSCE 311 or equivalent programming experience.
Description: Digital imaging systems, digital image processing, and low-level computer vision. Data structures, algorithms, and system analysis and modeling. Digital image formation and presentation, image statistics and descriptions, operations and transforms, and system simulation. Applications include system design, restoration and enhancement, reconstruction and geometric manipulation, compression, and low-level analysis for computer vision.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Course and Laboratory Fee: $10

CSCE 473 Computer Vision
Crosslisted with: CSCE 873
Prerequisites: CSCE 156, SOFT 161, or CSCE 311 or equivalent programming experience.
Notes: A grade of "Pass" or C or better in CSCE 156, SOFT 161, RAIK 184H or CSCE 311 or equivalent programming experience.
Description: High-level processing for image understanding and high-level vision. Data structures, algorithms, and modeling. Low-level representation, basic pattern-recognition and image-analysis techniques, segmentation, color, texture and motion analysis, and representation of 2-D and 3-D shape. Applications for content-based image retrieval, digital libraries, and interpretation of satellite imagery.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Course and Laboratory Fee: $40

CSCE 474 Introduction to Data Mining
Crosslisted with: CSCE 874
Prerequisites: A grade of "P" or "C" or better in CSCE 310, CSCE 310H, CSCE 311, SOFT 260, SOFT 260H or RAIK 283H; STAT 380, ECEN 305 or RAIK 270H.
Notes: Requires the completion of a project involving the application of data mining techniques to real-world problems.
Description: Data mining and knowledge discovery methods and their application to real-world problems. Algorithmic and systems issues. Statistical foundations, association discovery, classification, prediction, clustering, spatial data mining and advanced techniques.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

CSCE 475 Multiagent Systems
Crosslisted with: CSCE 875
Prerequisites: A grade of "P" or "C" or better in CSCE 310, CSCE 310H, CSCE 311, SOFT 260, SOFT 260H or RAIK 283H.
Description: Distributed problem solving and planning, search algorithms for agents, distributed rational decision making, learning multiagent systems, computational organization theory, formal methods in Distributed Artificial Intelligence, multiagent negotiations, emergent behaviors (such as ants and swarms), and Robocup technologies and real-time coalition formation.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

CSCE 476 Introduction to Artificial Intelligence
Crosslisted with: CSCE 876
Prerequisites: A grade of "P" or "C" or better in CSCE 310, CSCE 310H, CSCE 311, SOFT 260, SOFT 260H or RAIK 283H.
Description: Introduction to basic principles, techniques, and tools now being used in the area of machine intelligence. Languages for AI programming introduced with emphasis on LISP. Lecture topics include problem solving, search, game playing, knowledge representation, expert systems, and applications.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: CSCE 976
Course and Laboratory Fee: $40

CSCE 477 Cryptography and Computer Security
Crosslisted with: CSCE 877
Prerequisites: A grade of "P" or "C" or better in CSCE 310, CSCE 310H, CSCE 311, SOFT 260, SOFT 260H or RAIK 283H; MATH 314.
Description: Introductory course on cryptography and computer security. Topics: classical cryptography (substitution, Vigenere, Hill and permutation ciphers, and the one-time pad); Block ciphers and stream ciphers; The Data Encryption Standard; Public-key cryptography, including RSA and El-Gamal systems; Signature schemes, including the Digital Signature Standard; Key exchange, key management and identification protocols.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Course and Laboratory Fee: $35

CSCE 478 Introduction to Machine Learning
Crosslisted with: CSCE 878
Prerequisites: A grade of "P" or "C" or better in CSCE 310, CSCE 310H, CSCE 311, SOFT 260, SOFT 260H or RAIK 283H.
Notes: STAT 380, ECEN 305, or RAIK 270H recommended.
Description: Introduction to the fundamentals and current trends in machine learning. Possible applications for game playing, text categorization, speech recognition, automatic system control, date mining, computational biology, and robotics. Theoretical and empirical analyses of decision trees, artificial neural networks, Bayesian classifiers, genetic algorithms, instance-based classifiers and reinforcement learning.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Course and Laboratory Fee: $50

CSCE 479 Introduction to Deep Learning
Crosslisted with: CSCE 879
Prerequisites: A grade of "P" or "C" or better in CSCE 310, CSCE 310H, CSCE 311, SOFT 260, SOFT 260H or RAIK 283H.
Notes: Completing STAT 380/RAIK 270H or ECEN 305 prior to taking this course is recommended.
Description: Fundamentals and current trends in deep learning. Backpropagation, activation functions, loss functions, choosing an optimizer, and regularization. Common architectures such as convolutional, autoencoders, and recurrent. Applications such as image analysis, text analysis, sequence analysis, and reinforcement learning.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: SPRING
Course and Laboratory Fee: $50

CSCE 484 Data Science Professional Development
Prerequisites: CSCE 311
Description: Preparation for the senior design project. Professional practice through familiarity with current tools, resources, and technologies. Professional standards, practices and ethics, and the oral and written report styles used specifically in the field of data science.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: FALL

CSCE 486 Computer Science Professional Development
Prerequisites: A grade of "Pass" or "C" or better in SOFT 261, SOFT 261H, CSCE 361, or CSCE 361H. JGEN 200.
Notes: Must be taken exactly one semester before CSCE 487 or CSCE 487H.
Description: Preparation for the senior design project. Professional practice through familiarity with current tools, resources, and technologies. Professional standards, practices and ethics, and the oral and written report styles used specifically in the field of computer science.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: CSCE 487; CSCE 487H
ACE: ACE 8 Civic/Ethics/Stewardship
Course and Laboratory Fee: $10
Experiential Learning: Case/Project-Based Learning

CSCE 486H Honors Computer Science Professional Development
Prerequisites: A grade of "Pass" or "C" or better in SOFT 261, SOFT 261H, CSCE 361, or CSCE 361H. JGEN 200.
Notes: Must be taken exactly one semester before CSCE 487 or CSCE 487H.
Description: Preparation for the senior design project. Professional practice through familiarity with current tools, resources, and technologies. Professional standards, practices and ethics, and the oral and written report styles used specifically in the field of computer science.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: FALL
Prerequisite for: CSCE 487H
ACE: ACE 8 Civic/Ethics/Stewardship
Experiential Learning: Case/Project-Based Learning

CSCE 487 Computer Science Senior Design Project
Prerequisites: CSCE 486
Notes: Should be taken in the immediate next term after CSCE 486.
Description: A substantial computer science project requiring design, planning and scheduling, teamwork, written and oral communications, and the integration and application of technical and analytical aspects of computer science and software engineering.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: SOFT 403; SOFT 403H
ACE: ACE 10 Integrated Product
Course and Laboratory Fee: $40
Experiential Learning: Case/Project-Based Learning

CSCE 487H Honors Computer Science Senior Design Project
Prerequisites: CSCE 486 or CSCE 486H.
Notes: Should be taken in the immediate next term after CSCE 486 or CSCE 486H.
Description: A substantial computer science project requiring design, planning and scheduling, teamwork, written and oral communications, and the integration and application of technical and analytical aspects of computer science and software engineering.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: SPRING
Prerequisite for: SOFT 403H
ACE: ACE 10 Integrated Product
Experiential Learning: Case/Project-Based Learning

CSCE 488 Computer Engineering Professional Development
Prerequisites: CSCE 336; A grade of "Pass" or "C" or better in CSCE 361 or CSCE 361H; formal admission to the College of Engineering; prereq or coreq: JGEN 300.
Notes: Must be taken exactly one semester before CSCE 489 or CSCE 489H.
Description: Preparation for the senior design project. Professional practice through familiarity and practice with current tools, resources, and technologies; professional standards, practices, and ethics; and oral and written report styles used in the computer engineering field.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: CSCE 489; CSCE 489H
ACE: ACE 8 Civic/Ethics/Stewardship
Course and Laboratory Fee: $10
Experiential Learning: Case/Project-Based Learning

CSCE 488H Honors Computer Engineering Professional Development
Prerequisites: CSCE 336; A grade of "Pass" or "C" or better in CSCE 361 or CSCE 361H; formal admission to the College of Engineering; prereq or coreq: JGEN 300.
Notes: Must be taken exactly one semester before CSCE 489 or CSCE 489H.
Description: Preparation for the senior design project. Professional practice through familiarity and practice with current tools, resources, and technologies; professional standards, practices, and ethics; and oral and written report styles used in the computer engineering field.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: FALL
Prerequisite for: CSCE 489H
ACE: ACE 8 Civic/Ethics/Stewardship
Experiential Learning: Case/Project-Based Learning

CSCE 489 Computer Engineering Senior Design Project
Prerequisites: CSCE 488 (taken exactly one semester previous).
Description: A substantial computer engineering project requiring hardware-software co-design, planning and scheduling, teamwork, written and oral communications, and the integration and application of technical and analytical aspects of computer science and computer engineering.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
ACE: ACE 10 Integrated Product
Course and Laboratory Fee: $40
Experiential Learning: Case/Project-Based Learning

CSCE 489H Honors Computer Engineering Senior Design Project
Prerequisites: CSCE 488 or CSCE 488H (taken exactly one semester previous).
Description: A substantial computer engineering project requiring hardware-software co-design, planning and scheduling, teamwork, written and oral communications, and the integration and application of technical and analytical aspects of computer science and computer engineering.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: SPRING
ACE: ACE 10 Integrated Product
Experiential Learning: Case/Project-Based Learning

CSCE 492 Special Topics in Computer Science
Crosslisted with: CSCE 892
Prerequisites: CSCE 310/310H, CSCE 311, SOFT 260/260H/RAIK 283H, or graduate standing.
Description: Aspects of computers and computing not covered elsewhere in the curriculum presented as the need arises.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 6
Grading Option: Graded with Option
Course and Laboratory Fee: $40

CSCE 492H Honors Special Topics in Computer Science
Prerequisites: Permission.
Description: Topics vary
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 6
Grading Option: Graded with Option

CSCE 493 Innovation Lab Project
Prerequisites: CSCE 310, CSCE 310H, CSCE 311, or CSCE 320
Description: Innovative team projects executed under the guidance of members of the faculty of the Department of Computer Science and Managing Director of the CSCE Innovation Lab. Students will work in teams and collaborate with CSE research faculty, supervising MS students, and sponsors that include private sectors and UNL faculty to design and develop real-world systems.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 6
Grading Option: Graded with Option
Experiential Learning: Case/Project-Based Learning

CSCE 493A Interdisciplinary Capstone
Prerequisites: CSCE 311
Notes: Does not apply toward any requirements for the Computer Science or Computer Engineering degree. Required for the Informatics minor.
Description: Innovative team projects executed under the guidance of members of the faculty of the Department of Computer Science and Managing Director of the CSCE Innovation Lab. Work in teams and collaboration with CSE research faculty and sponsors that include private sectors and UNL faculty to design and develop real-world systems to solve interdisciplinary problems.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 6
Grading Option: Graded
Experiential Learning: Case/Project-Based Learning

CSCE 495 Internship in Computing Practice
Prerequisites: Permission.
Notes: Requires a detailed project proposal and final report.
Description: Experiential learning in conjunction with an approved industrial or government agency under the joint supervision of an outside sponsor and a faculty advisor.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 6
Grading Option: Graded with Option
Experiential Learning: Internship/Co-op

CSCE 498 Computer Problems
Crosslisted with: CSCE 898
Prerequisites: Senior or graduate standing.
Description: Independent project executed under the guidance of a member of the faculty of the Department of Computer Science. Solution and documentation of a computer problem demanding a thorough knowledge of either the numerical or nonnumerical aspects of computer science.
Credit Hours: 1-6
Min credits per semester: 1
Max credits per semester: 6
Max credits per degree: 6
Grading Option: Graded with Option

Career Information

The following represents a sample of the internships, jobs and graduate school programs that current students and recent graduates have reported.

Transferable Skills

- Implement appropriate technological interventions to help solve problems
- Collaborate with a team to develop solutions
- Simplify complex information and present it to others
- Use quantitative analysis techniques
- Document and replicate processes and procedures
- Apply mathematical and scientific skills to solve real-world problems
- Make decisions carefully, using appropriate theoretical frameworks
- Make predictions using mathematical, statistical, and scientific modeling methods

Jobs of Recent Graduates

- Mobile App Developer, Sandhills Publishing - Lincoln, NE
- Software Consultant, Self Employed - Austin, TX
- Programmer, Nebraska Heart Hospital - Lincoln, NE
- Business Technology Support Technician, Nebraska Department of Roads - Lincoln, NE
- GIS Web Developer/Analyst, The North Jackson Company - Marquette, MI
- Officer, United States Air Force - Cheyenne, WY
- Software Developer, Experian - Lincoln, NE
- Systems Application Specialist, Sandhills Publishing - Lincoln, NE
- Data Engineer, Hudl - Lincoln, NE
- Technology Specialist, TD Ameritrade - Omaha, NE
- Software Engineer, Union Pacific - Omaha, NE
- Software Engineer, Lockheed Martin - Littleton, CO
- Implementation Consultant, Fast Enterprises, LLC - Atlanta, GA
- Junior Application Developer, Builder Trend - Omaha, NE
- Developer, Microsoft - Redmond, WA

Internships

- System Application Developer Intern, Gallup - Lincoln, NE
- Sandhills Systems Intern, Sandhills Publishing - Lincoln, NE
- Data Science Intern, Hudl - Lincoln, NE
- Junior Developer, NeSis - Lincoln, NE
- Student Web Developer, Internet and Interactive Media, University of Nebraska-Lincoln - Lincoln, NE
- Year Round PC Build Intern, Union Pacific - Council Bluffs, IA
- Software Development Intern, Nelnet - Lincoln, NE
- IOS Intern, OSG Corporation - Irving, TX
- Programmer, GIS Workshop - Lincoln, NE
- Research Intern, ABB Corporate Research Center - Raleigh, NC
- Web Develop Intern, Lincoln Stars - Lincoln, NE
- Functional Assurance Intern, FISERV - Lincoln, NE
- Software Engineer Intern, Bosch Security System - Lincoln, NE
- Application Development Intern, BuilderTREND - Omaha, NE
- Software Developer Engineer Intern, Zillow - Lincoln, NE

Graduate & Professional Schools

- Master's in Data Science, University of Minnesota - Twin Cities, MN
- Master's in Computer Science, University of Nebraska-Lincoln - Lincoln, NE
- Ph.D., Computer Science, University of Nebraska-Lincoln - Lincoln, NE
- Master's in Mathematical Science, Purdue University - West Lafayette, IN
- Juris Doctorate, University of Nebraska-Lincoln - Lincoln, NE
- Ph.D., Physics, University of Nebraska-Lincoln - Lincoln, NE
- Ph.D., Computer Science, University of Texas at Austin - Austin, TX
- Master's in Computer Science, Arizona State University - Tempe, AZ
- Medical Doctor, University of Nebraska Medical Center - Omaha, NE
- Ph.D., Computer Science, Ohio State University - Columbus, OH