COMPUTER ENGINEERING (OMAHA)

Description

Website: engineering.unl.edu/ece (http://engineering.unl.edu/ceen/)

The computer engineering program is administered by the Department of Electrical and Computer Engineering, and the bachelor of science degree program is accredited by the Engineering Accreditation Commission (EAC) of ABET, http://www.abet.org.

Mission

The mission of the Department of Electrical and Computer Engineering (ECE) programs on the Scott Campus (in Omaha) at the University of Nebraska is to develop and maintain programs of excellence in teaching and research which meet the educational needs of its constituents, which will support the state of Nebraska in its development as a leading center for high-technology computer/electronics/telecommunications industry and which will support national needs for well-educated ECE professionals.

Program Educational Objectives

The Program Educational Objectives (PEOs) for the computer engineering program are a statement of what its graduates are doing or are capable of doing three to five years after graduation. The students in the computer engineering program receive a strong foundation in engineering science and design that not only enables them to pursue productive careers in the computer engineering field but also in other areas such as business, management, and medicine. Typical industries in which computer engineering graduates are employed include microprocessor/embedded system design, digital design, hardware/software integration, and computer architecture and parallel processing.

The Program Educational Objectives for the computer engineering program are that graduates will be:

1. Employed in business, academia, or government.
2. Successful engineers who have established productive careers in their field and have contributed to improve and provide innovative and effective solutions in computer engineering or related fields.
3. Demonstrating technical and decision-making processes and the human interactions necessary to produce viable, responsible, and sustainable technological solutions.
4. Engaging in lifelong learning, which may include postgraduate education, to successfully adapt to technological, industry specific, and cultural changes and to foster adept functioning in society.
5. Performing engineering practice in a context that reflects awareness of the ethics of their profession and of the impacts of their work on the profession and society at large.

These Program Educational Objectives were developed with input from the program's educational objectives constituency consisting of employers (including ECE Industry Advisory Board), graduates of the program, and faculty of the department.

Admission
General Requirements

Requirements for admission to the computer engineering program are that the student has:

- Maintained a cumulative GPA of at least 2.4 and is in good standing in the College of Engineering.
- Completed ECEN 213 Electrical Circuits I and ECEN 313 Switching Circuits Theory with a grade of C or better.

A transfer student will be admitted if they have:

- Completed courses equivalent to ECEN 213 and ECEN 313 at other institutions with acceptable transfer grades of C or better.
- Earned a GPA of 2.4 or better during their first 12 credit hours in computer engineering coursework at the University of Nebraska–Lincoln.

Transfer students will be able to appeal to the advisors for admission if they fail to meet the GPA requirement for an additional semester.

Advisement

Upon entry into the program, each student will be assigned a faculty academic advisor. It is required that the student meets with the advisor prior to each class registration period and that all courses to be applied toward the degree be selected with the advice and approval of the advisor. Students are expected to have their academic records reviewed and obtain approval from the department prior to application to the University Registrar for award of the degree in order to ensure that all curricular requirements will be satisfied by the time of intended graduation.

Curriculum

Because of the rapid developments in the field of computer engineering, the curricular requirements are continually reviewed and upgraded to reflect technological advances. Curricular sequence and course descriptions contained herein are intended to serve as general guidelines. Contact the department for information on any changes to the requirements that are currently in effect but not listed in this catalog. Currently enrolled students are expected to modify their programs to take advantage of such revisions. Students who do not maintain continuous progress toward the degree through enrollment in applicable coursework will be considered new students upon reentering the computer or electronics engineering curricular sequence and will be subject to the requirements of the curriculum current at the time of their reentry. Certain courses may not be valid as prerequisites or as credit toward the degree after two academic years; the student's academic advisor should be consulted regarding applicability.

The department maintains a high standard of excellence in meeting its objective of providing the student with extensive experience in the fields of computer engineering and electronics engineering. The development of both hardware and software and the knowledge of the interrelationship of these areas is enhanced through the extensive use of laboratory equipment. The applicable University catalogs and College academic policies must be followed to ensure that the student satisfies the campus general education requirements.

Capstone

The capstone requirement provides a unique and challenging opportunity for the undergraduate student to demonstrate his/her ability to apply the knowledge gained in the coursework sequence to the planning,

design, execution, testing, and reporting of a significant project in the applications of engineering principles. The initiative and responsibility expected of the student executing the capstone parallel the expectations of the employer of the program graduate.

Electives
Electrical and Computer Engineering (ECEN) courses that are described in the catalog but are not shown as requirements in the semester sequences are offered as the need arises to provide co-interest areas wherein the students may broaden their background in the applications of computer engineering or electrical engineering. In addition, appropriate specified technical electives will be selected to augment the student's particular area of interest. The applicability of transfer coursework with engineering content toward credit in the curriculum is determined on a case-by-case basis by the department.

Special Interest Areas
Opportunities are provided for the development of areas of special interest through enrollment in the Individual Study in Computer and Electronics Engineering courses which are offered at the freshman through senior level for the student who may wish to develop a topic under the guidance of a department faculty member. Enrollment is by permission after approval of a written proposal. Special Topics in Computer and Electronics Engineering classes also are offered by the department as the need arises to cover topics needing emphasis as a result of the rapidly developing fields of computer engineering and electronics engineering. Academic advisors should be consulted regarding the particular topics to be covered and the necessary prerequisites for each offering of this course.

Students who expect to continue their education at the graduate level after the award of the baccalaureate degree should consult their advisor regarding course selections that would enhance that objective.

Students are encouraged to develop their professional and leadership potential through participation in student chapters of related professional organizations and in University extracurricular activities. Participation in the University Honors Program is encouraged for those who qualify.

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.

Student outcomes per abet

Graduates of the computer engineering program will have:

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. An ability to communicate effectively with a range of audiences.
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

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 faculty of the Department of Electrical and Computer Engineering.

Major Requirements
Requirements for the Degree

First Semester		
CSCE 155A	Computer Science I	3
or CSCE 155E	Computer Science I: Systems Engineering Focus	
ECEN 103	Electrical and Computer Engineering Fundamentals	4
JGEN 300	Technical Communication II	3
MATH 106	Calculus I	5
Credit Hours Subtotal:		15
Second Semester		
CSCE 156	Computer Science II	4
ECEN 106	Microprocessor Applications	3
ECEN 123	Introduction to Electrical and Computer Engineering	1
ECEN 225	Electrical and Computer Engineering Seminar	1
MATH 107	Calculus II	4
PHYS 211	General Physics I	4
Credit Hours Subtotal:		17
Third Semester		
COMM 209	Public Speaking	3
ECEN 213	Electrical Circuits I	3
ECEN 218	Electrical Circuits Laboratory	1
MATH 221	Differential Equations	3
PHYS 212	General Physics II	4
PHYS 222	General Physics Laboratory II	1
Credit Hours Subtotal:		15
Fourth Semester		
ECEN 217	Electrical Circuits III	1
ECEN 222	Electronic Circuits I	4
ECEN 313	Switching Circuits Theory	4
MATH 208	Calculus III	4
ACE 5 Elective		3
Credit Hours Subtotal:		16
Fifth Semester		
CSCE 310	Data Structures and Algorithms	3
ECEN 305	Probability Theory and Statistics for Electrical and Computer Engineers	3
ECEN 310	Digital Design and Interfacing	4
ECEN 332	Assembly Language Programming	1
MATH 314	Linear Algebra	3
Credit Hours Subtotal:		14
Sixth Semester		
ECEN 325	Communications Systems	4
ECEN 433	Microprocessor System Design	4
Engineering Electives		6
ACE 6 Elective		3
Credit Hours Subtotal:		17
Seventh Semester		
ECEN 435	Embedded Microcontroller Design	4
ECEN 496	Computer Engineering Capstone I	2

ENGR 469	Technology, Science and Civilization (UNO) [1]	3
Engineering Electives		3
ACE 7 Elective		3
Credit Hours Subtotal:		15
Eighth Semester		
ECEN 499	Computer Engineering Capstone II	3
Engineering Electives		9
ACE 9 Elective		3
Credit Hours Subtotal:		15
Total Credit Hours		**124**

[1] ENGR 469 *is ACE 8*

Technical Electives

The computer engineering program requires 18 hours of engineering electives. These consist of at least 15 hours of any ECEN courses at the junior or senior level as well as ECEN 214/2140 or ECEN 216/2160. Students can substitute 3 of these hours with a course from the following list:

Computer Science (Omaha CSCI) courses:

4150/8156 - Graph Theory and Applications

4220/8226 - Programming Languages

4300/8306 - Deterministic Operations Research Models

4310/8316 - Probabilistic Operations Research Models

4440/8446 - Introduction to Parallel Computing

4450/8456 - Introduction to Artificial Intelligence

4470/8476 - Pattern Recognition

4500/8506 - Operating Systems

4510/8516 - Advanced Operating Systems

4620/8626 - Computer Graphics

4660/8666 - Automata, Computability and Formal Languages

4760/8766 - Topics in Modeling

4830/8836 - Introduction to Software Engineering

4850/8856 - Database Management Systems

Math (Omaha MATH) courses:

4150/8156 - Graph Theory and Applications

4300/8306 - Deterministic Operations Research Models

4310/8316 - Probabilistic Operations Research Models

4660/8666 - Automata, Computability and Formal Languages

4760/8766 - Topics in Modeling

Career Information

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

Jobs of Recent Graduates

- Electronics Engineer, National Air and Space Intelligence Center - Dayton, OH
- Design Engineer, Garmin - Olathe, KS
- Jr. Project Engineer, Union Pacific - Omaha, NE
- Product Manager, Hudl - Lincoln, NE
- Embedded Systems Engineer, Lockheed Martin - Denver, CO
- Software Developer, IBM - Rochester, MN
- Computer Engineer, United States Department of Defense - San Antonio, TX
- Software Developer in Test, Amazon - Seattle, WA
- Software Developer Engineer, Microsoft - Seattle, WA
- System Integration Specialist, Sandhills Publishing - Lincoln, NE
- Software Engineer, Target Headquarters - Minneapolis, MN
- Software Design Engineer, Communication System Solutions - Lincoln, NE
- Embedded Software Engineer I, Northrop Grumman - San Diego, CA
- Junior Applications Developer, BuilderTrend - Omaha, NE
- Senior Managing Consultant, IBM - Austin, TX
- Controls Engineer, Anderson Industrial Engines - Omaha, NE
- Frontend Engineer, Hayneedle, Inc. - Omaha, NE
- Software Engineer, Cerner Corporation - Kansas City, MO
- Senior IT Infrastructure Support Analyst, State of Nebraska - Lincoln, NE
- Design Engineer & Project Manager, LI-COR Biosciences - Lincoln, NE
- Software Developer, Epic Systems - Verona, WI
- Application Developer II, Buildertrend, Inc. - Omaha, NE
- Electronic Engineer, United States Department of Defense - Bedford, MA
- Software Developer, Spreetail - Lincoln, NE
- Firmware Design Engineer, Fisher Controls - Marshalltown, IA

Internships

- System Intern, Sandhills Publishing - Lincoln, NE
- Aviation Software Engineer, Garmin - Olathe, KS
- Software Engineer Intern, Microsoft - Redmond, WA
- Simulation Lab Intern, University of Nebraska Medical Center - Omaha, NE
- Hardware Engineer, Springbok Inc. - Omaha, NE
- Software Development Intern, Epic Systems - Madison, WI
- Software Engineering Intern, Firespring - Lincoln, NE
- Applications Developer Intern, Gallup - Omaha, NE
- Design Engineering Intern, Communication Systems Solutions - Lincoln, NE
- Network Design Intern, Union Pacific - Omaha, NE
- TTS Intern, Target - Minneapolis, MN
- Cyber Security Notification System (CYNOT), Nebraska Public Power District-Cooper Nuclear - Brownville ,NE
- Quality Engineer Intern, Bosch Security Systems - Lincoln, NE

- Creative Consultant, UNL Information and Technology Services - Lincoln, NE
- Software Development Intern, Cerner - Kansas City, MO
- Software Quality Analyst Intern, Hudl - Lincoln, NE
- Research Student, Illinois Institute of Technology - Chicago, IL
- Software Development, National Strategic Research Institute - Omaha, NE
- Research Assistant, University of Alabama - Tuscaloosa, AL
- App Development Intern, Farm Credit Services of America - Omaha, NE
- System Application Developer Intern, Gallup - Lincoln, NE
- Quality Engineer Intern, Bosch Security Systems - Lincoln, NE
- Intern, Machine Solutions, Inc. - Flagstaff, AZ
- Software Developer Intern, Molex - Lincoln, NE
- Intern, Tesla Motors - Fremont, CA

Graduate & Professional Schools
- Master's in Electrical Engineering, University of Nebraska-Lincoln - Lincoln, NE
- Ph.D., Electrical Engineering, University of California - Los Angeles, CA
- Master's in Software Engineering, University of Sheffield - Sheffield, Great Britain
- Master's in Visualization, Texas A&M University - College Station, TX
- Ph.D., Computer Science, University of Colorado - Boulder, CO
- Master's in Information Technology, University of Texas - Austin,TX
- Medical Sciences Interdepartmental Areas, University of Nebraska Medical Center - Omaha, NE
- Master's in Computer Science, University of Nebraska-Lincoln - Lincoln, NE
- Master's in Mathematics, University of Nebraska Omaha - Omaha, NE