COMPUTER ENGINEERING, BACHELOR OF SCIENCE

The College of Engineering offers a complete computer engineering undergraduate program to students on the city (Lincoln) campus and the Scott (Omaha) campus of the University of Nebraska. Curriculum requirements are nearly identical on both campuses and students can complete all degree requirements on either campus.

In the college, the School of Computing and the Department of Electrical and Computer Engineering offer this challenging baccalaureate degree program in computer engineering that prepares graduates for professional practice in commerce, industry, and government and for post graduate education to enter careers in research and academia. The focus of the program is hands on integrated hardware/software system design. Increasingly, diverse systems, products, and processes depend on computers for design, control, data acquisition , and other functions. The computer engineer possesses the range of expertise to have an integrated view of computer-based systems and to make global decisions.

The 124 credit-hours program in computer engineering leads to the Bachelor of Science degree in Computer Engineering. Thirty (30) hours of mathematics and science complement the required 58 hours of work in the computer engineering area. Six (6) hours in written and oral communications, twelve (12) hours in humanities and social sciences, and eighteen (18) hours of engineering electives provide the opportunity for the student to acquire a general educational background and gain cultural attributes with a university education.

The individual holding this degree will have advanced knowledge in his or her field of engineering interest and in addition will have a university educational background involving mathematics, the physical sciences, and the humanities and social sciences. Completion of this curriculum will enable the graduate to enter employment in positions involving computer hardware design and applications, computer software design and development, microcomputer based applications, and computer networking. The program also leads to the preparation for graduate work in computer engineering, computer science or electrical engineering.

Program Educational Objectives

The Program Educational Objectives (PEOs) are a statement of what 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 fields but also play an integral role in advancing other areas including business, management, medicine and manufacturing through computer engineering technologies. The Program Educational Objectives for the Computer Engineering program are that graduates will be:

- Employed in business, non-profit, academia, government, or industry.
- Successful engineers who view computer systems as an integrated contiunuum of technologies, which engaging and collaborating with professionals in related fields to provide innovative, effective, responsible, and sustainable computer engineering solutions.
- Capable of quickly adapting to new work environments, assimilating new information, solving new problems, and creating new devices.
- Engaging in lifelong learning, which may include postgraduate education and being part of professional organizations, to successfully adapt to technological, industry specific, and cultural changes and to foster adept functioning in society.
- 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 constituency, consisting of employers (including the Industry Advisory Board), graduates of the program, and faculty .

Student Outcomes

Student Outcomes are those abilities that a graduate of the Computer Engineering program will have attained so that he/she can meet the educational objectives established for the program.

At the time of graduation, students in 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.

Professional Admission Requirements

Pre-professionally admitted College of Engineering students majoring in computer engineering will be granted profession admission into the computer engineering program if the students have:

- maintained a cumulative GPA of at least 2.4 and is in good standing in the College of Engineering, and
- received at least a C in ECEN 215, ECEN 230 and CSCI 3320

A transfer student will be admitted if he/she has:

- completed courses equivalent to ECEN 215, ECEN 230 and CSCI 3320 at other institutions with acceptable transfer grades of C or better, and
- earned a GPA of 2.4 or better during their first 12 credit hours in computer engineering course work at UNL/UNO.

Transfer students will be able to appeal to the College's Academic Appeals Committee for admission for an additional semester if they fail to meet the GPA requirement.

See the College of Engineering section of the catalog for details on admission to the college.

Requirements

Course	Title	Credits
First Year		
First Semester		
MATH 1950	CALCULUS I	5
ECEN 155E	COMPUTER SCIENCE I	3
ECEN 164	INTRODUCATION TO COMPUTER ENGINEERING	2
ENGR 100	INTERPERSONAL SKILLS FOR ENGINEERING LEADERS [1]	3
ENGR 10	FRESHMAN ENGINEERING SEMINAR	0
	Credits	**13**
Second Semester		
MATH 1960	CALCULUS II	4
PHYS 2110	GENERAL PHYSICS I - CALCULUS LEVEL	4
PHYS 1154	GENERAL PHYSICS LABORATORY I	1
ECEN 156	COMPUTER SCIENCE II	4
ENGL 1160	ENGLISH COMPOSITION II	3
	Credits	**16**
Second Year		
First Semester		
MATH 2050	APPLIED LINEAR ALGEBRA	3
MATH 2350	DIFFERENTIAL EQUATIONS	3
PHYS 2120	GENERAL PHYSICS-CALCULUS LEVEL	4
ECEN 215	ELECTRONICS AND CIRCUITS I [2]	3
ECEN 235	INTRODUCTORY ELECTRICAL LABORATORY I [3]	1
CSCI 2030	MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE	3
ENGR 20	SOPHOMORE ENGINEERING SEMINAR	0
	Credits	**17**
Second Semester		
CSCI 3320	DATA STRUCTURES	3
ECEN 230	COMPUTER DESIGN	4
ECEN 222	ELECTRONIC CIRCUITS I	4
ECEN 251	UNIX PROGRAMMING ENVIRONMENT	1
ECEN 313	SWITCHING CIRCUITS THEORY	4
	Credits	**16**
Third Year		
First Semester		
ECEN 305	PROBABILITY THEORY AND STATISTICS FOR ELECTRICAL AND COMPUTER ENGINEERS	3
ECEN 220	INTRODUCTION TO EMBEDDED SYSTEMS	4
ECEN 304	SIGNALS AND SYSTEMS I	3
ECEN 478	PRACTICAL MACHINE LEARNING	3
ACE ELECTIVE [4]		3
	Credits	**16**
Second Semester		
ECEN 325	COMMUNICATIONS SYSTEMS	4
CSCI 4830	INTRODUCTION SOFTWARE ENGINEERING	3
ECEN 487	DATA AND NETWORK SECURITY [5]	3
ENGINNERING ELECTIVE [6]		3
ACE ELECTIVE [4]		3
	Credits	**16**
Fourth Year		
First Semester		
ECEN 351	SYSTEM RESOURCE MANAGEMENT	3
ECEN 496	COMPUTER ENGINEERING CAPSTONE I	3
ENGINEERING ELECTIVES [6]		9
	Credits	**15**
Second Semester		
ECEN 499	COMPUTER ENGINEERING CAPSTONE II	3
ENGINEERING ELECTIVES [6]		6
ACE ELECTIVES [4]		6
	Credits	**15**
	Total Credits	**124**

[1] CMST 1110 may be substituted for ENGR 100

[2] ECEN 213 may be substituted for ECEN 215

[3] ECEN 218 may be substituted for ECEN 235

[4] ACE electives: Choose one course from not yet satisfied ACE outcomes 5,6,7 or 9

[5] ECEN 484 may be substituted for ECEN 487

[6] Engineering Electives

The Computer Engineering program requires 18 hours of Engineering electives. Of these 18 credit hours, at least 12 credit hours must be taken in one of the Computer Engineering (ECEN) emphasis areas. Below is a list of courses in each emphasis area.

1. Signal, Image, and Video Processing

ECEN 415 (https://catalog.unomaha.edu/search/?P=ECEN%20410) core Digital Image Processing

ECEN 463 (https://catalog.unomaha.edu/search/?P=ECEN%20463) core Digital Signal Processing

ECEN 465 (https://catalog.unomaha.edu/search/?P=ECEN%20465) Intro Data Compression

ECEN 444 (https://catalog.unomaha.edu/search/?P=ECEN%20465) Linear Control Systems

ECEN 498 (https://catalog.unomaha.edu/search/?P=ECEN%20465) Special Topics: Real Time DSP Application

ECEN 498 (https://catalog.unomaha.edu/search/?P=ECEN%20465) Special Topics: Introduction to Computer Visio2.

2. Cyber Security

ECEN 498 (https://catalog.unomaha.edu/search/?P=ECEN%20408) core Special Topics: Cyber Security

ECEN 488 (https://catalog.unomaha.edu/search/?P=ECEN%20467) core Wireless Security

ECEN 462 (https://catalog.unomaha.edu/search/?P=ECEN%20468) Communication Systems

3. Communications and Networking

ECEN 462 (https://catalog.unomaha.edu/search/?P=ECEN%20310) core Communication Systems

ECEN 471 (https://catalog.unomaha.edu/search/?P=ECEN%20362) core Computer Communication Networks

ECEN 465 (https://catalog.unomaha.edu/search/?P=ECEN%20352) Intro Data Compression

ECEN 475 (https://catalog.unomaha.edu/search/?P=ECEN%20469) Satellite Communications

ECEN 476 (https://catalog.unomaha.edu/search/?P=ECEN%20470) Wireless Communications

ECEN 479 (https://catalog.unomaha.edu/search/?P=ECEN%20470) Optical Fiber Communications

ECEN 488 (https://catalog.unomaha.edu/search/?P=ECEN%20470) Wireless Security

4. IoT and Cyber Physical Systems

ECEN 433 (https://catalog.unomaha.edu/search/?P=ECEN%20338) core Microprocessor System Design

ECEN 435 (https://catalog.unomaha.edu/search/?P=ECEN%20406) core Embedded Microcontroller Design

ECEN 438 (https://catalog.unomaha.edu/search/?P=ECEN%20428) Integrated Systems Programming

ECEN 462 (https://catalog.unomaha.edu/search/?P=ECEN%20310) Communication Systems

ECEN 469 (https://catalog.unomaha.edu/search/?P=ECEN%20430) Analog Integrated Circuits

ECEN 474 (https://catalog.unomaha.edu/search/?P=ECEN%20436) Digital Systems

ECEN 476 (https://catalog.unomaha.edu/search/?P=ECEN%20470) Wireless Communications

ECEN 477 (https://catalog.unomaha.edu/search/?P=ECEN%20444) Digital Systems Organization and Design
ECEN 498 (https://catalog.unomaha.edu/search/?P=ECEN%20465) Special Topics: Real Time DSP Application

5. Autonomous Systems & Robotics

ECEN 433 (https://catalog.unomaha.edu/search/?P=ECEN%20417) core Microprocessor System Design

ECEN 345 (https://catalog.unomaha.edu/search/?P=ECEN%20420) core Mobile Robotics I

ECEN 444 (https://catalog.unomaha.edu/search/?P=ECEN%20421) Linear Control Systems

6. Machine Intelligence

ECEN 410 (https://catalog.unomaha.edu/search/?P=ECEN%20450) core Multivariate Random Processes

ECEN 437 (https://catalog.unomaha.edu/search/?P=ECEN%20460) core Parallel and Distributed Processing

ECEN 448 (https://catalog.unomaha.edu/search/?P=ECEN%20453) Decision Analysis

ECEN 498 (https://catalog.unomaha.edu/search/?P=ECEN%20498) Special Topics: Computational Modeling and Simulation

7. High Performance Computing

ECEN 437 (https://catalog.unomaha.edu/search/?P=ECEN%20460) core Parallel and Distributed Processing

ECEN 451 (https://catalog.unomaha.edu/search/?P=ECEN%20460) core Intro VLSI System Design

ECEN 452 (https://catalog.unomaha.edu/search/?P=ECEN%20460) Intro Computer-Aided Digital Design

8. Bioinformatics and Computational Biology

ECEN 450 (https://catalog.unomaha.edu/search/?P=ECEN%20498) core Bioinformatics

ECEN 453 (https://catalog.unomaha.edu/search/?P=ECEN%20498) core Computational and Systems Biology

ECEN 460 (https://catalog.unomaha.edu/search/?P=ECEN%20498) Labview Programming

ECEN 498 (https://catalog.unomaha.edu/search/?P=ECEN%20498) Special Topics: Bioengineering Image and Signal Processing

Three to six credit hours must include the required core courses depending on each emphasis area. Of the remaining six to nine credit hours, three must be in a different emphasis area, and the remaining three to six credit hours must be in the same emphasis area.

The remaining 6 credit hours of technical electives may be taken from any 300- or 400-level course offering (with the exception of those listed below) in the Department of Electrical and Computer Engineering or in any other engineering department within the College of Engineering at UNL, or in the UNO Departments of Biology, Chemistry, Computer Science, Mathematics, or Physics or in the UNL Departments of Biological Sciences, Chemistry, Computer Science and Engineering, Mathematics, Statistics, or Physics and Astronomy.

Not Allowed 300- and 400-Level Technical Electives

ENGR 469 (https://catalog.unomaha.edu/search/?P=ENGR%20469) Technology, Science and Civilization

BIOL 3500 (https://catalog.unomaha.edu/search/?P=BIOL%203500) Biological Principles of Aging

CSCI 3710 (https://catalog.unomaha.edu/search/?P=CSCI%203710) Introduction to Digital Design and Computer Organization

STAT 3000 (https://catalog.unomaha.edu/search/?P=STAT%203000) Statistical Methods I

UNL BIOS 310 School of Biological Sciences Seminar

UNL IMSE 305 Introduction to Engineering Management

MATH 4980 (https://catalog.unomaha.edu/search/?P=MATH%204980) Seminar or UNL MATH 495 (http://bulletin.unl.edu/undergraduate/courses/MATH/495/) Seminar

UNL MATH 496 (http://bulletin.unl.edu/undergraduate/courses/MATH/496/) Seminar in Mathematics

or any other seminar-type courses.

Allowed 100 and 200 Level Technical Electives

UNL AGEN 225 (http://bulletin.unl.edu/undergraduate/courses/AGEN/225/) Engineering Properties of Biological Materials (BSEN 225 (http://bulletin.unl.edu/undergraduate/courses/BSEN/225/))

PHYS 4350 (https://catalog.unomaha.edu/search/?P=PHYS%204350) Astrophysics or ASTR 204 Introduction to Astronomy & Astrophysics

UNL ASTR 224 (http://bulletin.unl.edu/undergraduate/courses/ASTR/224/) Astronomy & Astrophysics Lab

BIOL 2140 (https://catalog.unomaha.edu/search/?P=BIOL%202140) Genetics or UNL BIOS 206 (http://bulletin.unl.edu/undergraduate/courses/BIOS/206/) General Genetics

BIOL 2740 (https://catalog.unomaha.edu/search/?P=BIOL%202740) Human Physiology and Anatomy I or UNL BIOS 213 (http://bulletin.unl.edu/undergraduate/courses/BIOS/213/) Human Physiology

CHEM 1190 (https://catalog.unomaha.edu/search/?P=CHEM%201190) General Chemistry II and CHEM 1194 (https://catalog.unomaha.edu/search/?P=CHEM%201194) General Chemistry II Laboratory or UNL CHEM 110 (http://bulletin.unl.edu/undergraduate/courses/CHEM/110/) General Chemistry II

CHEM 1190 (https://catalog.unomaha.edu/search/?P=CHEM%201190) General Chemistry II or UNL CHEM 114 (http://bulletin.unl.edu/undergraduate/courses/CHEM/114/) Fundamental Chemistry II

Any 2000 level chemistry course or UNL CHEM 2xx

UNL MATL 260 (http://bulletin.unl.edu/undergraduate/courses/MATL/260/) Elements of Materials Science

UNL MATL 262 (http://bulletin.unl.edu/undergraduate/courses/MATL/262/) Materials Lab I

MECH 223 (https://catalog.unomaha.edu/search/?P=MECH%20223) Engineering Statics

MECH 200 (https://catalog.unomaha.edu/search/?P=MECH%20200) Engineering Thermodynamics