Ph.D. in Computer Engineering

Admission Requirements
The candidate must meet the following minimum prerequisites for admission to the program:

- A Bachelor Degree in Computer Engineering, Electrical Engineering, Computer Science, or another closely related area.
- A GPA of at least 3.0 on a 4.0 scale (B average or better).
- Preparation in terms of coursework with passing grades in the following subject areas (the following are also subjects covered in the qualifying examinations):
  - Computer Architecture/Microprocessors
  - Operating Systems, Data Structures and Algorithms
  - Circuits (Analog Circuits and Systems, Digital Circuits, and VLSI Design)
  - EE-Systems (Signals and Systems, Digital Systems)

Those found deficient in their preparation, but otherwise demonstrating good potential, may be admitted provisionally with required coursework to remove the deficiencies.

- GRE general test: typically, applicants admitted to the program have scores of: 700 or higher on Quantitative, 500 or higher on Verbal, and 3.5 or higher on Analytical
- TOEFL test for applicants whose native language is not English: typically, applicants admitted to the program have score of: (1) Paper based, 55/68 each on Listening, Reading and Structure/Writing, and 4.0/6.0 on TWE (Essay), (2) Computer based, 21/30 each on Listening, Reading and Structure/Writing, and 4.0/6.0 on TWE (Essay), or (3) Internet based, 21/30 each on Listening, Reading and Writing.

Additionally, all applications for admission must also include the following:

- Three letters of reference from people who can comment on the candidate’s potential to succeed as a PhD student, and
- The candidate’s curriculum vitae, including a statement of objectives and interests.

Breadth & Depth Requirements
Three tracks of courses for the Computer Engineering program are defined and listed below. The breadth and depth requirements entail that three groups of classes be taken by a candidate:

- Group 1: 9 credit hours – All classes should be selected from a single track closest to the candidate’s dissertation research area to be determined by the supervisory committee.
- Group 2: 9 credit hours – All classes should be selected from two of the tracks not selected for Group 1. At least 3 credit hours should be selected from each of the two tracks.
- Group 3: (MINOR) 6 credit hours – CS OR EE approved minor courses other than the courses listed in the three tracks.

Depth requirements are decided by student, research advisor, and the supervisory committee. A total of 90 credit hours are required of which 24 to 30 credit hours may be used for dissertation. No fewer than 45 credit hours must be completed at UNL. College of Engineering policies apply for transfer of credits.

TRACK 1: CIRCUITS AND CYBER-PHYSICAL INTERFACES
- CSCE 43X/83X. Cyber-Physical Systems and Interfaces *
- CSCE 434/834. VLSI Design
- CSCE 436/836. Embedded Systems
- CSCE 496/896. Special Topics–VLSI Physical Design
- CSCE 932. Fault–Tolerance: Testing/Testable Design
- ELEC 416/816. Materials and Devices for Computer Memory, Logic, and Display
- ELEC 417/817. Integrated Circuits
- ELEC 469/869. Analog Integrated Circuits
- ELEC 470/870. Digital and Analog VLSI Design
- ELEC 9XX. Advanced Analog and Mixed Signal Circuits*

TRACK 2: SYSTEMS
- CSCE 430/830. Computer Architecture
- CSCE 413/813. Data Base Systems
- CSCE 425/825. Compiler Construction
- CSCE 432/832. High Performance Processor Architectures
- CSCE 437/837. File and Storage Systems
- CSCE 455/855. Distributed Operating Systems
- CSCE 456/856. Parallel Programming
- CSCE 458/858 Real–Time Systems
- CSCE 435/835. Cluster and Grid Computing
- CSCE 496/896 Special Topics–Self-Managing Computer Systems
- CSCE 933. Fault–Tolerance: System Design and Analysis
- ELEC 451/851. Linear System Analysis and Design
- ELEC 470/870. Digital Systems Organization and Design
- ELEC 8XX. Discrete/Continuous System Modeling and Simulation*


**ELEC 9XX. Advanced Digital Design**

**TRACK 3: COMMUNICATIONS, NETWORKING, & SIGNAL PROCESSING**

- CSCE 462/862. Communication Networks
- CSCE 464/864. Internet Programming
- CSCE 496/896. Special Topics—Adv Internet Technologies
- CSCE 496/896. Special Topics—Data and Network Security
- CSCE 496/896. Special Topics—Sensor Networks
- CSCE 463/863. Introduction to Coding Theory
- CSCE 472/872. Digital Image Processing
- CSCE 473/873. Computer Vision
- CSCE 952. ADV Computer Network
- CSCE953. Optical Communication Networks
- CSCE 990. Seminar—Network Systems
- CSCE 990. Special Topics—Advanced Sensor Networks
- ELEC 408/808. Electromagnetic Fields and Waves
- ELEC 410/810. Multivariate Random Processes
- ELEC 462/862. Communication Systems
- ELEC 463/863. Digital Signal Processing
- ELEC 464/864. Digital Communication Systems
- ELEC 465/865. Data Compression
- ELEC 467/867. Electromagnetic Theory and Applications
- ELEC 498/898. Image and Video Processing
- ELEC 911. Communication Theory
- ELEC 912. Error Control Coding
- ELEC 915. Adaptive Signal Processing
- ELEC 996. Multi-camera Systems
- ELEC 996. Wireless Communications

*Final course numbers to be assigned for XX courses*

Additionally, the student must attend at least 30 departmental colloquia, doctoral oral presentations, and/or master’s thesis presentations during the Ph.D. program. A sign-up sheet is used during these events as proof of attendance. Note that master’s project presentations may not be used to fulfill this requirement.

**Qualifying Examination**

- **Frequency:** Once per semester (Fall and Spring) with a schedule to synchronize with the qualifying examination for the PhD in Computer Science.
- **Structure:** The qualifying examination will be divided into four subject areas: (1) Computer Architecture/Microprocessors, (2) Operating Systems, Data Structures and Algorithms, (3) Circuits (Analog Circuits and Systems, Digital Circuits, and VLSI Design), and (4) EE-Systems (Signals and Systems, Digital Systems). It will comprise of four equally weighted problems from each of the four tracks, for a total of 16 problems.
- **Choice of Problems:** The candidate may choose to answer 8 of the 16 problems, with the following stipulations: (a) at least one problem must be chosen from each of the four subject areas and (b) At least three problems must be chosen from either subject areas (1) and (2) or subject areas (3) and (4).

**Comprehensive Examination**

- The candidate's supervisory committee may choose from one of the following two formats:
  1. Writing an in–depth dissertation proposal, including a comprehensive review of the literature describing the state–of–the–art related to the broader topic.
  2. Preparing a research proposal similar in form and contents to an NSF–proposal.

**Supervisory Committee**

- The supervisory committee must be formed after the candidate has passed the qualifying examination, according to the schedule stipulated by the Graduate Studies.
- The candidate’s dissertation advisor serves as the chair of the supervisory committee. If the candidate has two dissertation advisors, both serve as co–chairs of the supervisory committee.
- When the candidate’s advisor(s) belong to just one department (CSE/EE), the supervisory committee must include at least one member from another department (EE/CSE/Another (# ftn2)), who also serves on the reading committee.

(# ftnref) The PhD in Computer Engineering field has its administrative home in the Department of Computer Science and Engineering. Currently, the faculty participating in the field come from CSE and EE.

(# ftnref) It is possible and sometimes desirable to have a member of the supervisory committee who comes from a third department of the college.