Electrical and Computer Engineering

Faculty: Hernandez, *Chair,* Adegbege, Deese, Katz, Kim, Pearlstein

The Department of Electrical and Computer Engineering offers academic programs leading to a Bachelor of Science in Electrical Engineering and a Bachelor of Science in Computer Engineering. The Computer Engineering and Electrical Engineering programs are accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org.

Electrical engineers are concerned with electrical devices and systems and with the use of electrical energy. Virtually every industry uses electrical engineers, and electrical engineering is the largest of all engineering disciplines. Examples of the products designed by electrical engineers range from the computers used in business to instruments used in the medical profession, military radar systems, cellular telephones, and video conferencing equipment.

The electrical engineering curriculum allows students to focus on communications, electronic devices, instrumentation, digital signal processing, and automatic control systems.

Computer engineering is a discipline that addresses a variety of technological problems associated with the design and application of computers. Computer engineering is concerned with the design and implementation of digital hardware and software.

The curriculum for the computer engineering degree provides breadth and depth across the fields of electrical engineering and computer science. The curriculum structure provides a balanced view of hardware, software, hardware-software trade-offs, and basic modeling techniques used to represent the computing process. The degree requirements include completion of coursework from the computer science as well as the electrical and computer engineering departments.

Electrical and Computer Engineering Educational Objectives

The Department of Electrical and Computer Engineering at The College of New Jersey seeks to prepare its graduates:

- To contribute to the economic development of New Jersey and the nation through the ethical practice of engineering;

- To become successful in their chosen career path, whether it is in the practice of engineering, in advanced studies in engineering or science, or in other complementary disciplines;

- To assume leadership roles in industry or public service through engineering ability;

- To maintain career skills through life-long learning.

Electrical and Computer Engineering Student Outcomes

The student outcomes listed below are expected of all graduates of the electrical and computer engineering programs. These outcomes outline what TCNJ electrical and computer engineering graduates are expected to know and be able to do at graduation. These outcomes outline the knowledge, abilities, tools, and skills the programs give the graduates to enable them to accomplish the programs' educational objectives.

Electrical and computer engineering graduates will have:
- An ability to apply knowledge of mathematics, science, and engineering;
- An ability to design and conduct experiments, as well as to analyze and interpret data;

- An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability;

- An ability to function in multidisciplinary teams;

- An ability to identify, formulate, and solve engineering problems;

- An understanding of professional and ethical responsibility;

- An ability to communicate effectively;

- The broad education necessary to understand the impact of engineering solutions in a global and societal context;

- A recognition of the need for and an ability to engage in life-long learning;

- A knowledge of contemporary issues;

- An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Academic Policies and Standards

A student may repeat any course without seeking approval. However, if a student wishes to repeat a course more than once, permission must be obtained from the chair of the department or coordinator of the program of study and, if appropriate, the chair of the department offering the course. Permission to repeat a major course more than once will be granted only in cases of extreme extenuating circumstances, e.g., illness, financial, etc. When an engineering course is repeated, only the most recent earned grade is counted in the grade point average, although all grades earned will appear on the student's transcript.

Seniors pursuing bachelor of science degrees in an engineering major are required to take the Fundamentals of Engineering Examination for the Professional Engineer's License.

Given the nature of the engineering curricula, it is extremely important to follow the recommended course sequence. Violations of this guideline may result in dismissal from the engineering majors.

Program Entrance, Retention, and Exit Standards

Every major program at the College has set standards for allowing students to remain in that program, to transfer within the College from one program to another, and to graduate from a program. The following are the standards for engineering majors. Minimum grades are noted in parentheses.

- Retention in the engineering programs is based on the following performance standards in these "critical content courses": PHY 201 (C–); PHY 202 (C–), MAT 128 (C-). A student who does not achieve these minimum performance standards, earns a grade of F, and/or has a cumulative GPA of less than 2.0 will be placed on the Engineering Programs Retention List. Placement on the Retention List for two consecutive semesters or three non-consecutive semesters will result in dismissal from the major. Students dismissed from the major may appeal for re-entry into the major.

- To ensure academic success, first year, sophomore, and first-semester junior students will not be permitted to take more than 4.5 course units unless they have a GPA of 2.75 or greater. Upper class students can register for 5.5 course units if they are in good academic standing.

- Entrance (internal transfer) into the engineering programs from another program within the College is based upon the following performance standards in these "foundation courses": PHY 201 (C–); PHY 202 (C–), MAT 128 (C-). Internal transfer within engineering programs will be considered as long as enrollment limits are not exceeded.

- Graduation requires an in-major cumulative GPA of 2.0.

Bachelor of Science in Computer Engineering

First Year

Fall

CHE	201/General Chemistry I	1 course unit
ENG	142/Fundamentals of Engineering Design	
or		
CSC	215/Computer Science I	1 course unit
ENG	095/Introduction to Engineering	0 course unit
ENG	091/Engineering Seminar I	0 course unit
FSP	First Seminar (Social Sciences)*	1 course unit
MAT	127/Calculus A	1 course unit
PHY	201/General Physics I	1 course unit

* By advisement only.

Spring

CSC	215/Computer Science I	
or		
ENG	142/Fundamentals of Engineering Design	1 course unit
ENG	092/Engineering Seminar II	0 course unit
MAT	128/Calculus B	1 course unit
PHY	202/General Physics II	1 course unit
WRI	102/Academic Writing (if not exempted)	(1 course unit)
TST	161/Creative Design	1 course unit

Sophomore Year

Fall

PHY	321/Modern Physics	1 course unit
CSC	250/Accelerated Computer Science I, II	1 course unit
ENG	212/Circuit Analysis	1 course unit
ENG	214/Circuit Analysis Laboratory	.5 course unit
ENG	272/Advanced Engineering Mathematics I	1 course unit
ENG	312/Digital Circuits and Microprocessors	1 course unit

Spring

CSC	270/Discrete Structures	1 course unit
ELC	251/Electronics	1 course unit
ELC	321/Signals and Systems	1 course unit
ELC	333/Electronics Laboratory	.5 course unit
MAT	229/Multivariable Calculus	1 course unit
ECO	101/Principles of Microeconomics	1 course unit

Junior Year

Fall

CSC	415/Software Engineering	1 course unit
ELC	343/Microcomputer Systems	.5 course unit
ENG	093/Engineering Seminar III	0 course unit
ELC	451/Computer Arch. & Organization	1 course unit
ELC	363/Computer Engineering Lab 1	.5 course unit
ELC	411/Embedded Systems	1 course unit
	Computer Engineering Elective	1 course unit

Spring

ENG	094/Engineering Seminar IV	0 course unit
ENG	348/Systems Engineering	.5 course unit
ENG	352/Control Systems	1 course unit
ENG	354/Control Systems Laboratory	.5 course unit
ENG	372/Engineering Economy	1 course unit
	Mathematics Elective*	1 course unit
	Computer Engineering Elective*	1 course unit

Senior Year

Fall

IDS	252/Society, Ethics, and Technology	1 course unit
ELC	423/Digital Signal Processing	1 course unit
ELC	433/Signal Processing Laboratory	.5 course unit
ELC	495/Senior Project I	.5 course unit
ENG	099/Senior Professional Seminar	0 course unit
	Computer Engineering Elective*	1 course unit
	Liberal Learning Elective*	1 course unit

* By advisement only.

Spring

CSC	345/Operating Systems	1 course unit
ENG	098/Fundamentals of Engineering Review	0 course unit
ELC	463/Computer Engineering Laboratory II	.5 course unit
ELC	496/Senior Project II	.5 course unit
	Computer Engineering Elective*	1 course unit
	Liberal Learning Elective*	1 course unit

Total course units   **39 course units**

  * By advisement only.

Mathematics Electives

One of the following:
    ENG 342/Advanced Engineering Mathematics II

Computer Engineering Electives

At least two of the following:
    ELC 341/Communication Systems
    ELC 383/Electronics II
    ELC 441/Digital Systems Engineering

ELC 453/Digital Control Systems
ELC 471/VLSI Design
ELC 475/Advanced Digital Signal Processing
ELC 470/Special Topics (by advisement only)

At most two of the following:
CSC 315/Database Systems
CSC 350/Computer Graphics
CSC 360/Computer Networking
CSC 380/Artificial Intelligence
CSC 425/Compilers & Interpreters
CSC 435/Programming Languages
CSC 485/Topics in Computer Science
ENG 222/Statics
ENG 262/Dynamics
ENG 322/Thermodynamics
MEC 381/Introduction to Mechatronics
ELC 483/Robotics
ELC 492/Independent Study
ENG 470/Special Topics in Engineering (by advisement only)

Minor in Computer Engineering

CSC	250/Computer Science I, II or the equivalent	1 course unit
ENG	212/Circuit Analysis	1 course unit
ENG	312/Digital Circuits and Microprocessors	1 course unit
ELC	343/Microcomputer Systems	.5 course unit
ELC	363/Computer Engineering Lab 1	.5 course unit
ELC	451/Computer Architecture and Organization	1 course unit

Total course units   **5* course units**

* Only one course unit taken as part of the student's major may also be counted toward the student's minor.

Bachelor of Science in Electrical Engineering

First Year

Fall

CHE	201/General Chemistry I	1 course unit
ENG	142/Fundamentals of Engineering Design	
or		
CSC	215/Computer Science I	1 course unit
ENG	095/Introduction to Engineering	0 course unit
ENG	091/Engineering Seminar I	0 course unit
FSP	First Seminar (Social Sciences)*	1 course unit
MAT	127/Calculus A	1 course unit
PHY	201/General Physics I	1 course unit

* By advisement only.

Spring

CSC	215/Computer Science I	
or		
ENG	142/Fundamentals of Engineering Design	1 course unit

ENG	092/Engineering Seminar II	0 course unit
MAT	128/Calculus B	1 course unit
PHY	202/General Physics II	1 course unit
WRI	102/Academic Writing (if not exempted)	(1 course unit)
TST	161/Creative Design	1 course unit

Sophomore Year

Fall

PHY	321/Modern Physics	1 course unit
ENG	212/Circuit Analysis	1 course unit
ENG	214/Circuit Analysis Laboratory	.5 course unit
ENG	272/Advanced Engineering Mathematics I	1 course unit
ENG	312/Digital Circuits and Microprocessors	1 course unit
ECO	101/Principles of Microeconomics	1 course unit

Spring

CSC	270/Discrete Structures	1 course unit
ELC	251/Electronics	1 course unit
ELC	321/Signals and Systems	1 course unit
ELC	333/Electronics Laboratory	.5 course unit
MAT	229/Multivariable Calculus	1 course unit
IDS	252/Society, Ethics, and Technology	1 course unit

Junior Year

Fall

ELC	341/Communication Systems	1 course unit
ELC	343/Microcomputer Systems	.5 course unit
ENG	093/Engineering Seminar III	0 course unit
ELC	411/Embedded Systems	1 course unit
ELC	451/Computer Architecture and Organization	1 course unit
ELC	363/Computer Engineering Laboratory I	.5 course unit
	Electrical Engineering Elective*	1 course unit

Spring

ELC	361/Engineering Electromagnetics	1 course unit
ELC	373/Wireless and Communication Laboratory	.5 course unit
ENG	094/Engineering Seminar IV	0 course unit
ENG	348/Systems Engineering	.5 course unit
ENG	352/Control Systems	1 course unit
ENG	354/Control Systems Laboratory	.5 course unit

Senior Year

Fall

ELC	423/Digital Signal Processing	1 course unit
ELC	433/Signal Processing Laboratory	.5 course unit
ELC	495/Senior Project I	.5 course unit
ENG	372/Engineering Economy	1 course unit
ENG	099/Senior Professional Seminar	0 course unit
	Electrical Engineering Elective*	1 course unit
	Liberal Learning Elective*	1 course unit

Spring

ENG	098/Fundamentals of Engineering Review	0 course unit
ELC	383/Electronics II	1 course unit
ELC	496/Senior Project II	.5 course unit
	Mathematics/Science Elective	1 course unit
	Electrical Engineering Elective*	1 course unit
	Liberal Learning Elective*	1 course unit

Total Course Units   **39 course units**
  * By advisement only.

Mathematics/Science Electives

One of the following:
  ENG 342/Advanced Engineering Mathematics II
  MAT 316/Probability
  STA 215/Statistical Inference
  CHE 202/General Chemistry II
  PHY 436/Condensed Matter

Electrical Engineering Electives

At least two of the following:
  ELC 431/RF/Microwave Engineering
  ELC 441/Digital Engineering Systems
  ELC 453/Digital Control Systems
  ELC 471/VLSI Design
  ELC 473/Bioinstrumentation
  ELC 475/Advanced Digital Signal Processing
  ELC 470/Special Topics (by advisement only)

At most two of the following:
  ENG 152/Engineering Materials Science
  ENG 222/Statics
  ENG 262/Dynamics
  ENG 322/Thermodynamics
  MEC 381/Introduction to Mechatronics
  ELC 473/Bioinstrumentation
  ELC 483/Robotics
  ELC 492/Independent Study
  ENG 470/Special Topics in Engineering (by advisement only)

Minor in Electrical Engineering

ENG	212/Circuit Analysis	1 course unit
ELC	251/Electronics	1 course unit
ENG	312/Digital Circuits and Microprocessors	1 course unit
ELC	321/Systems and Signals	1 course unit
	Electrical Engineering Elective*	1 course unit

Total course units   **5** course units**
  * Electrical engineering elective must be chosen from the following: ELC 341, ENG 352, ELC 383, ELC 423, ELC 441.
  ** Only one course unit taken as part of the student's major may also be counted toward the student's minor.