

Electrical and Computer Engineering

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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 Bachelor of Science in Computer Engineering is accredited by the Engineering Accreditation Commission of ABET, <https://www.abet.org>, under the commission's General Criteria and Program Criteria for Electrical, Computer, Communications, Telecommunication(s), and Similarly Named Engineering Programs.

The Bachelor of Science in Electrical Engineering is accredited by the Engineering Accreditation Commission of ABET, <https://www.abet.org>, under the commission's General Criteria and Program Criteria for Electrical, Computer, Communications, Telecommunication(s), and Similarly Named Engineering Programs.

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. The computer engineering curriculum addresses a variety of technological problems associated with the design and application of computers as well as digital software/hardware in general.

Electrical and Computer Engineering Educational Objectives

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

- o To contribute to the economic development of New Jersey and the nation through the ethical practice of engineering;
- o 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;
- o To assume leadership roles in industry or public service through engineering ability;
- o 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:

- o An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- o 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.
- o An ability to communicate effectively with a range of audiences
- o 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.
- o 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.
- o An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
- o An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

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.

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.

- o Retention in the engineering programs is based on the following performance standards in these "critical content courses": PHY 201 (C-); MAT 127 (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.
- o 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.

- o 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); MAT 127 (C). Internal transfer within engineering programs will be considered as long as enrollment limits are not exceeded.
- o Graduation requires an in-major cumulative GPA of 2.0.

Bachelor of Science in Electrical Engineering

First Year

Fall

ENG095	Introduction to Engineering	0.0 course units
ENG144	Fundamentals of Engineering Design	0.5 course units
MAT127	Calculus A	1.0 course units
PHY201	General Physics I	1.0 course units
TST161	Creative Design	1.0 course units
ECO101	Principles of Microeconomics	1.0 course units

Spring

MAT128	Calculus B	1.0 course units
PHY202	General Physics II	1.0 course units
CSC220	Computer Science I	1.0 course units
ELC145	ECE-Specific Freshman Design Section	0.5 course units
FYS16X	First Year Seminar*	1.0 course units

Second Year

Fall

ENG212	Circuits Analysis	1.0 course units
ENG272	Adv. Engineering Mathematics I	1.0 course units
ENG312	Digital Circuits and Microprocessors	1.0 course units
PHY321	Modern Physics	1.0 course units
CC	College Core Elective	1.0 course units

Spring

ELC251	Electronics	1.0 course units
ENG214	Circuits Analysis Laboratory	0.5 course units
ELC321	Systems and Signals	1.0 course units
MAT229	Multivariable Calculus	1.0 course units
MATH	Mathematics Elective*	1.0 course units

Third Year

Fall

ENG093	Engineering Seminar III	0.0 course units
ELC341	Communication Systems	1.0 course units
ELC411	Embedded Systems with Lab	1.0 course units
ELC333	Electronics Lab	0.5 course units
ELC451	Computer Architecture and Org.	1.0 course units

TechE	Technical Elective	1.0 course units
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Spring

ENG094	Engineering Seminar IV	0.0 course units
ENG352	Control Systems	1.0 course units
ELC363	Computer Engineering Laboratory I	0.5 course units
ELC361	Engineering Electromagnetics	1.0 course units
ELC373	Wireless and Communications Lab	0.5 course units
ENG348	Systems Engineering	1.0 course units
TechE	Technical Elective	1.0 course units

Fourth Year**Fall**

ENG099	Senior Professional Seminar	0.0 course units
ELC495	Senior Project I	0.5 course units
ELC423	Digital Signal Processing	1.0 course units
ENG354	Control Systems Laboratory	0.5 course units
IDS252	Society, Ethics and Technology	1.0 course units
TechE	Technical Elective	1.0 course units

Spring

ELC496	Senior Project II	0.5 course units
ELC383	Electronics II	1.0 course units
ELC433	Signal Processing Lab	0.5 course units
TechE	Technical Elective	1.0 course units
CC	College Core	1.0 course units
	Total	36.0 course units

Bachelor of Science in Computer Engineering**First Year****Fall**

ENG095	Introduction to Engineering	0.0 course units
ENG144	Fundamentals of Engineering Design	0.5 course units
MAT127	Calculus A	1.0 course units
PHY201	General Physics I	1.0 course units
TST161	Creative Design	1.0 course units
ECO101	Principles of Microeconomics	1.0 course units

Spring

MAT128	Calculus B	1.0 course units
PHY202	General Physics II	1.0 course units
CSC220	Computer Science I	1.0 course units
ELC145	ECE-Specific Freshman Design Section	0.5 course units
FYS16X	First Year Seminar*	1.0 course units

Second Year

Fall

ENG212	Circuits Analysis	1.0 course units
ENG272	Adv. Engineering Mathematics I	1.0 course units
ENG312	Digital Circuits and Microprocessors	1.0 course units
CSC230	Computer Science II	1.0 course units
CC	College Core Elective	1.0 course units

Spring

ELC251	Electronics	1.0 course units
ENG214	Circuits Analysis Laboratory	0.5 course units
ELC321	Systems and Signals	1.0 course units
CSC270	Discrete Structures	1.0 course units
MAT229	Multivariable Calculus	1.0 course units

Third Year**Fall**

ENG093	Engineering Seminar III	0.0 course units
ELC411	Embedded Systems with Lab	1.0 course units
ELC333	Electronics Lab	0.5 course units
ELC451	Computer Architecture and Org.	1.0 course units
TechE	Technical Elective	1.0 course units
MATH	Mathematics Elective*	1.0 course units

Spring

ENG094	Engineering Seminar IV	0.0 course units
ENG352	Control Systems	1.0 course units
ELC363	Computer Engineering Laboratory I	0.5 course units
CSC345	Operating Systems	1.0 course units
ENG348	Systems Engineering	1.0 course units
TechE	Technical Elective	1.0 course units

Fourth Year**Fall**

ENG099	Senior Professional Seminar	0.0 course units
ELC495	Senior Project I	0.5 course units
ELC423	Digital Signal Processing	1.0 course units
ELC463	Computer Engineering Laboratory II	0.5 course units
ENG354	Control Systems Laboratory	0.5 course units
IDS252	Society, Ethics and Technology	1.0 course units
TechE	Technical Elective	1.0 course units

Spring

ELC496	Senior Project II	0.5 course units
CSC415	Software Engineering	1.0 course units
ELC433	Signal Processing Lab	0.5 course units
TechE	Technical Elective	1.0 course units

CC	College Core	1.0 course units
	Total	36.0 course units

Note on Technical Electives – Students must take a total of four technical electives from the list below. Two categories exist: 1) ECE discipline electives and 2) engineering electives. Students may fulfill the technical elective requirement by taking: 1) four ECE discipline electives, 2) three ECE discipline electives and one engineering elective, or 3) two ECE discipline electives and two engineering electives. See the list below:

- ECE-Specific Technical Elective Listing (between 2 and 4)
 - ELC477: Power Systems and Renewability
 - ELC435: Artificial Neural Networks
 - ELC431: RF/Microwave Engineering
 - ELC441: Digital Engineering Systems
 - ELC453: Digital Control Systems
 - ELC471: VLSI Design
 - ELC475: Advanced Digital Signal Processing
 - ELC480: Digital Video Processing and Compression
 - ELC470: Cybersecurity
 - ELC470: Advanced Sensor Networks
 - ELC470: Advanced Semiconductor Materials
 - ELC470: Other Special Topics (by advisement only)
- The following course(s) are allowed for computer engineering students only.
 - ELC341: Communication Systems
 - ELC383: Electronics II
- General Engineering Elective Listing (2 maximum)
 - ENG470: Sustainability Europe
 - ENG152: Engineering Materials Science
 - ENG222: Statics
 - ENG262: Dynamics
 - ENG322: Thermodynamics
 - CSC300/400 Level Courses: Ask your advisor.

Notes on Mathematics Elective – Students must take one of the following, separate from the technical elective requirement: ENG342: Advanced Engineering Mathematics II, STA215: Statistical Inference and Probability.

Note on Credit Limit - To improve retention in the School of Engineering, students with fewer than 22.5 completed course units that achieve a cumulative GPA of 2.75 or less are limited to 4.5 course units per semester. This limit may be lower for students on the retention list or academic probation.

- 5.0 Course Units - for all ECE first semester students and seniors.

- 5.0 Course Units - for ECE freshmen/sophomore/juniors with cumulative GPA ≥ 2.75 .

Otherwise...

- 4.5 Course Units - for ECE freshmen/sophomores/juniors with cumulative GPA < 2.75 .

Those on the retention list are limited to only 3.0 course units/semester.