The College of New Jersey
School of Engineering
Electrical and Computer Engineering Department

Electrical Engineering Curriculum
Bachelor of Science in Electrical Engineering (2021 Update)
Learn More About ECE: https://bit.ly/ECEatTCNJvideo

Course Name	Course Number (w/ Links)	Prerequisites	Coreqs	Course Units
Fall Freshman Year				
General Chemistry I	CHE201	complete MAT096/MAT120, OR TCNJ Basic Algebra Readiness Score >= 15, OR SAT Math >= 630, or ACT > 28	none	1.0
Fundamentals of Engineering Design (or CS220)	ENG142	none	none	1.0
Introduction to Engineering	ENG095	none	none	0.0
Engineering Seminar I	ENG091	none	none	0.0
First-Year Writing (if not exempt)*	FYW102	none	none	(1.0)
Calculus A	MAT127	complete MAT096/MAT120, OR TCNJ Calculus Readiness Score >= 13, OR SAT Math >= 630, OR ACT > 28	none	1.0
General Physics I	PHY201	none	MAT125 or MAT127	1.0
Spring Freshman Year				
Computer Science I (or ENG142)	CSC220	none	none	1.0
Engineering Seminar II	ENG092	none	none	0.0
Calculus B	MAT128	MAT127	none	1.0
General Physics II	PHY202	PHY201 AND MAT 127	MAT128 (suggest)	1.0
Creative Design	TST161	none	none	1.0
First Year Seminar*	FYS16X	none	none	1.0
Fall Sophomore Year				
Modern Physics	PHY321	MAT127 AND PHY202	one	1.0
Principles of Microeconomics	ECO101	MAT095 OR MAT096	none	1.0

Circuits Analysis	ENG212	PHY202 (>=C)	ENG272	1.0
Circuits Analysis Laboratory	ENG214	none	ENG212	0.5
Adv. Engineering Mathematics I	ENG272	MAT128	none	1.0
Digital Circuits and Microprocessors	ENG312	none	CSC220	1.0
Spring Sophomore Year				
Discrete Structures	CSC270	CSC220 (>=C) OR CSC230 (>=C) AND MAT127 (>=C)	none	1.0
Electronics	ELC251	ENG212 AND ENG272	none	1.0
Systems and Signals	ELC321	ENG272	ENG212	1.0
Electronics Lab	ELC333	none	ELC251	0.5
Multivariable Calculus	MAT229	MAT128	none	1.0
Society, Ethics and Technology	IDS252	none	none	1.0
Fall Junior Year				
Communication Systems	ELC341	ELC251 AND ELC321	none	1.0
Microcomputer Systems (Lab)	ELC343	none	ELC411	0.5
Engineering Seminar III	ENG093	none	none	0.0
Embedded Systems	ELC411	ELC251 AND ELC312	none	1.0
Computer Architecture and Org.	ELC451	ENG312		1.0
Computer Engineering Laboratory I	ELC363	none	ELC451	0.5
Technical Elective: ECE Discipline or Engineering*		At least ELC251 AND ELC321	At least ELC451	1.0
Spring Junior Year				
Engineering Electromagnetics	ELC361	MAT229, ENG212, AND ENG272	none	1.0
Wireless and Communications Lab	ELC373	ELC341	ELC361	0.5
Engineering Seminar IV	ENG094	none	none	0.0
Control Systems	ENG352	ENG212 AND ENG272	none	1.0
Control Systems Laboratory	ENG354	none	ENG352	0.5
Systems Engineering	ENG348	ENG212 OR ENG222	none	0.5
Technical Elective: ECE Discipline or Engineering*		At least ELC251 AND ELC321	At least ELC451	1.0
Fall Senior Year				
Digital Signal Processing	ELC423	ENG312 AND ELC321	none	1.0
Signal Processing Lab	ELC433	none	ELC423	0.5
Engineering Economy	ENG372	MAT128 AND ECO101	none	1.0

Senior Project I	ELC495	ENG348, ELC411, AND ENG352	none	0.5
Senior Professional Seminar	ENG099	none	none	0.0
Technical Elective: ECE Discipline or Engineering*		At least ELC251 AND ELC321	At least ELC451	1.0
Liberal Learning Elective*		varies	varies	1.0
Spring Senior Year				
Mathematics Elective*		varies	varies	1.0
Electronics II	ELC383	ELC251	none	1.0
Senior Project II	ELC496	ELC495	none	0.5
Technical Elective: ECE Discipline or Engineering*		At least ELC251 AND ELC321	At least ELC451	1.0
Liberal Learning Elective*		varies	varies	1.0
FE Review	ENG098	none	none	0.0
			Total**	**39.0**

* By Advisement

**39 course units are required for the degree. Transfer courses that are accepted as equivalent to TCNJ courses may yield a fractional course unit, even though the course content is satisfied. In this case, students need to complete additional coursework to meet the 39 course unit requirement.

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:

Electrical Engineering Discipline Elective Listing (between 2 and 4)

- ELC431: RF/Microwave Engineering
- ELC441: Digital Engineering Systems
- ELC453: Digital Control Systems
- ELC471: VLSI Design
- ELC475: Advanced Digital Signal Processing
- ELC477: Power Systems and Renewability
- ELC480: Digital Video Processing and Compression
- ELC435: Artificial Neural Networks
- ELC470: Special Topics (by advisement only)

Engineering Elective Listing (2 maximum)

- ENG470: Sustainability Europe
- ENG152: Engineering Materials Science

- ENG222: Statics
- ENG262: Dynamics
- ENG322: Thermodynamics
- MEC381: Introduction to Mechatronics
- ELC391: Independent Study (not 492)

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

Notes on Liberal Learning Electives – Students must take liberal learning electives to address both requirements below. Students may complete their liberal learning requirement (theoretically) in two courses, assuming they choose courses correctly. For example, one could choose a "Societal Change in Historical Perspective" course that addresses the gender and global civic responsibilities long with any a "Literary, Visual, and Performing Arts" course that addresses the race and ethnicity civic responsibility. That is, again, simply an example.

RowID	Liberal Learning Domains	Course	Does Course To Left Address Civic Responsibility?
1	Literary, Visual, and Performing Arts	TST161	No
2	World Views and Ways of Knowing	IDS252	No
3	Behavioral, Social, or Cultural Perspectives	ECO101	No
4	Natural Science (with a Lab)	CHE201	No
5	Quantitative Reasoning	MAT127	No
6	Natural Science or Quantitative Reasoning	PHY201	No
7	Social Change in Historical Perspective	**You Choose...**	These two courses together must address the three following civic responsibilities: 1) gender, 2) global, and 3) race and ethnicity.
8	You must take one course from following domains: 1) Literary, Visual and Performing Arts, 2) World Views and Ways of Knowing, 3) Behavioral, Social or Cultural Perspectives, or 4) Social Change in Historical Perspectives.	**You Choose...**	

Caution!! Be very careful with topics courses. Topics courses may satisfy Liberal Learning requirements, but you must check very carefully to be certain that the specific topic in which you wish to enroll satisfies a particular requirement, as different topics with the same course prefix and number may not satisfy the same Liberal Learning requirements (see https://liberallearning.tcnj.edu/approved-courses-for-liberal-learning/ for a very helpful example). Also make sure the course meets the domain and civic responsibilities you need. A single course can satisfy up to one domain and up to two civic responsibilities. Some courses satisfy a domain but no civic responsibilities, and others satisfy civic responsibilities but no domain.

Additional information is available through the websites below.

- https://liberallearning.tcnj.edu/approved-courses-for-liberal-learning/
- https://liberallearning.tcnj.edu/choosing-liberal-learning-courses/
- https://engineering.tcnj.edu/resources/liberal-learning/

Note on Advanced Placement (AP) – Students may be awarded for a number of courses including Calculus, Physics, Chemistry, etc. For further details on AP placement click this link (https://bit.ly/2t7ixPF).

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.

Note on 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); 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.
- Students on academic probation are limited to 3.0 course units per semester.
- 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); MAT 127 (>= C), MAT 128 (>= C). Internal transfer within engineering programs will be considered if enrollment limits are not exceeded.
- Graduation requires an in-major cumulative GPA of 2.0

Term Limits:
- ECE Freshmen/Sophomores with Cum GPA < 2.75 = 4.5 course units
- All Other ECE Students = 5.5 course units
- Those on Retention List / Academic Probation = 3.0 course units

Computer Requirements – Students should have full-time access to a computer that meets or exceeds the following specifications:
- Form – Laptop computers are recommended, although desktops are acceptable.
- Release Year – All components within the system, including the processor, should have been released within the last two years, preceding the purchase. For example, a computer purchased for use in fall 2021 cannot employ an Intel Processor released in April 2019. Any new machine purchased from a major retailer should meet this requirement.
- Operating System – Windows 10/11 64-bit Home or Pro, not operating in the limited capability S-mode.
    - Students are strongly discouraged from buying a non-Windows device. They are responsible for handling ALL compatibility problems associated with the use of AppleOS or LinuxOS computers. Students should NOT rely on machines like tablets, iPads, or Chromebooks as their main computing device.
- Screen Size – Greater than 13.3 inches.
- Video Card – NVIDIA GeForce GTX 1600 or better.
    - Alternative brands with similar performance may be acceptable.
- Processor – Intel Core i7 or higher. AMD Ryzen 7 or higher.
- RAM – 16GB or more. 32GB recommended.
- Hard Drive –512GB or higher. 1TB+ recommended.