

Engineering Science

Faculty: Grega, Program Coordinator

Engineering science is an interdisciplinary program leading to a Bachelor of Science in Engineering Science with a specialization in Engineering Management or Policy and Society. The Engineering Science program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

Program Educational Objectives

The engineering science program has established the following educational objectives. These objectives outline what TCNJ engineers should be able to accomplish during the first few years after graduation.

- To contribute to the technical, societal, and/or economic development of New Jersey and the nation through the ethical practice of engineering and related fields;
- 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;
- To maintain career skills through life-long learning.

Engineering Science/Engineering Management Specialization

The engineering management specialization integrates engineering and management education to prepare students for engineering management. This program provides a strong base in a specific field of engineering while also allowing the flexibility to take business courses covering a diverse range of topics such as finance, management, and marketing. A graduate of this program would be capable of acquiring a position that is highly technical in nature, or one that is more business oriented. With a broad set of skills in place, bridging the gap between technology and business becomes a natural transition. Engineering management students must select a mechanical, electrical, or computer option for their studies.

Engineering Science/Policy and Society Specialization

The Policy and Society specialization prepares students to critically think about the application of engineering on society and the environment. Students will graduate with the skills to work in traditional engineering roles as well as para-technical fields in government agencies; such as FBI, NSA, CIA, NIH, DOE, DOD, and other general agencies. The program also serves students that want to pursue an engineering degree prior to entering law school. Engineering for Policy and Society examines the development of structures, devices, technologies, and methods that address problems relevant to how engineering may be used to improve the lives of people and society at large. Solutions that should contribute to both the protection and promotion of 1) safety and human welfare, 2) equality and social justice, 3) economic development and progress, as well as 4) environmental preservation and sustainability.

Engineering Science Student Outcomes

The program outcomes listed below are expected of all graduates of the engineering science program. These outcomes outline what TCNJ engineering science graduates are expected to know and be able to do at graduation. These outcomes outline the knowledge, abilities, tools, and skills the program gives the graduates to enable them to accomplish the program educational objectives.

Engineering science 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; and
- 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 delay time to graduation.

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.
- 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). Students must also be in good academic standing. Students who have not completed these foundation courses will be admitted as a Pre-Major and must complete them by the following semester. 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 Engineering Science—Engineering Management Specialization, Computer Preference

First Year

Fall

CHE	201/General Chemistry I	1 course unit
ENG	142/Fundamentals of Engineering Design	
	<i>or</i>	
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	1 course unit
MAT	127/Calculus A	1 course unit
PHY	201/General Physics I	1 course unit

Spring

CSC	215/Computer Science I	
	<i>or</i>	
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

CSC	250/Accelerated Computer Science I, II	1 course unit
ECO	101/Principles of Microeconomics	1 course unit
ENG	212/Circuits Analysis	1 course unit
ENG	214/Circuits Analysis Laboratory	.5 course unit
ENG	232/Manufacturing Processes	1 course unit

ENG 272/Advanced Engineering Mathematics I 1 course unit

Spring

ACC 201/Financial Accounting and Reporting 1 course unit
 ECO 102/Principles of Macroeconomics 1 course unit
 ENG 222/Statics 1 course unit
 ENG 312/Digital Circuits and Microprocessors 1 course unit
 MAT 229/Multivariable Calculus 1 course unit

Junior Year

Fall

BUS 200/Legal and Regulatory Environment of Business 1 course unit
 ELC 451/Computer Architecture and Organization 1 course unit
 ELC 363/Computer Engineering Laboratory I .5 course unit
 ENG 093/Engineering Seminar III 0 course unit
 MEC 321/Numerical Analysis 1 course unit
 MKT 201/Marketing Principles .5 course unit
 MGT 201/Managing in the 21st Century .5 course unit
 ENG 372/Engineering Economy 1 course unit

Spring

ENG 094/Engineering Seminar IV 0 course unit
 ENG 152/Engineering Material Science 1 course unit
 ENG 262/Dynamics 1 course unit
 ENG 342/Advanced Engineering Mathematics II 1 course unit
 ENG 452/Project Management 1 course unit
 ENG 348/Systems Engineering .5 course unit
 IDS 252/Society, Ethics, and Technology 1 course unit

Senior Year

Fall

ELC 495/Senior Project I .5 course unit
 ENG 099/Senior Professional Seminar 0 course unit
 ENG 322/Thermodynamics I 1 course unit
 ENG 352/Control Systems 1 course unit
 ENG 354/Control Systems Laboratory .5 course unit
 FIN 201/Fundamental Financial Methods .5 course unit
 Liberal Learning Elective* 1 course unit

Spring

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

Total course units

39 course units **

**By advisement only.*

***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.*

Computer Engineering Electives

CSC345 Operating Systems
 ELC321 Signals and Systems
 ELC453 Digital Control Systems
 ELC470 Special Topics (by advisement)

Bachelor of Science in Engineering Science—Engineering Management Specialization, Electrical Preference**First Year****Fall**

CHE	201/General Chemistry I	1 course unit
ENG	142/Fundamentals of Engineering Design	
	<i>or</i>	
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	1 course unit
MAT	127/Calculus A	1 course unit
PHY	201/General Physics I	1 course unit

Spring

CSC	215/Computer Science I	
	<i>or</i>	
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**

ECO	101/Principles of Microeconomics	1 course unit
ENG	212/Circuits Analysis	1 course unit
ENG	214/Circuits Analysis Laboratory	.5 course unit
ENG	232/Manufacturing Processes	1 course unit
ENG	272/Advanced Engineering Mathematics I	1 course unit
ENG	312/Digital Circuits and Microprocessors	1 course unit

Spring

ACC	201/Financial Accounting and Reporting	1 course unit
ECO	102/Principles of Macroeconomics	1 course unit
ELC	251/Electronics	1 course unit
ELC	321/Signals and Systems	1 course unit
ELC	333/Electrical Engineering Laboratory I	.5 course unit
MAT	229/Multivariable Calculus	1 course unit

Junior Year**Fall**

ENG 372/Engineering Economy	1 course unit
ELC 341/Communications Systems	1 course unit
ENG 093/Engineering Seminar III	0 course unit
ENG 222/Statics	1 course unit
ENG 342/Advanced Engineering Mathematics II	1 course unit
MEC 321/Numerical Analysis	1 course unit
MKT 201/Marketing Principles	.5 course unit

Spring

ENG 094/Engineering Seminar IV	0 course unit
ENG 152/Engineering Material Science	1 course unit
ENG 262/Dynamics	1 course unit
ENG 452/Project Management	1 course unit
MGT 201/Managing in the 21 st Century	.5 course unit
Liberal Learning Elective	1 course unit
IDS 252/Society, Ethics, and Technology	1 course unit

Senior Year**Fall**

ELC 495/Senior Project I	.5 course unit
ENG 099/Senior Professional Seminar	0 course unit
ENG 352/Control Systems	1 course unit
ENG 354/Control Systems Laboratory	.5 course unit
FIN 201/Fundamental Financial Methods	.5 course unit
Electrical Engineering Elective*	1 course unit
ENG 322/Thermodynamics I	1 course unit

Spring

ELC 496/Senior Project II	.5 course unit
ENG 098/Fundamentals of Engineering Review	0 course unit
BUS 200/Legal and Regulatory Environment of Business	1 course unit
Management Elective*	1 course unit
Liberal Learning Elective*	1 course unit

Total course units**39 course units****

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Electrical Engineering Electives

ELC 361/Digital Signal Processing
ELC 383/Electronics II
ELC 411/Embedded Systems
ELC 431/RF/Microwave Engineering
ELC 441/Digital Systems Engineering
ELC 453/Digital Control Systems
ELC 483/Robotics
ELC 492/Independent Study
ENG 472/Special Topics in Engineering
ENG 412/Process & Quality Control

Bachelor of Science in Engineering Science—Engineering Management Specialization, Mechanical Preference

First Year

Fall

CHE	201/General Chemistry I	1 course unit
ENG	142/Fundamentals of Engineering Design	
	<i>or</i>	
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	1 course unit
MAT	127/Calculus A	1 course unit
PHY	201/General Physics I	1 course unit

Spring

CSC	215/Computer Science I	
	<i>or</i>	
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

ECO	101/Principles of Microeconomics	1 course unit
ENG	212/Circuits Analysis	1 course unit
ENG	214/Circuits Analysis Laboratory	.5 course unit
ENG	222/Statics	1 course unit
ENG	232/Manufacturing Processes	1 course unit
ENG	272/Advanced Engineering Mathematics I	1 course unit

Spring

ECO	102/Principles of Macroeconomics	1 course unit
ENG	152/Engineering Material Science	1 course unit
ENG	262/Dynamics	1 course unit
MAT	229/Multivariable Calculus	1 course unit
MEC	251/Strength of Materials	1 course unit
MEC	236/Mechanical Engineering Lab 1	.5 course unit

Junior Year

Fall

ENG	093/Engineering Seminar III	0 course unit
ENG	322/Thermodynamics I	1 course unit
ENG	342/Advanced Engineering Mathematics II	1 course unit
ENG	372/Engineering Economy	1 course unit
MEC	311/Mechanical Design Analysis I	1 course unit
MEC	321/Numerical Analysis	1 course unit

Spring

ENG 094/Engineering Seminar IV	0 course unit
ENG 452/Project Management	1 course unit
MEC 361/Fluid Mechanics	1 course unit
ACC 201/Financial Accounting	1 course unit
MGT 201/Managing in the 21 st Century	.5 course unit
Liberal Learning Elective*	1 course unit

* By advisement only.

Senior Year**Fall**

ENG 099/Senior Professional Seminar	0 course unit
ENG 352/Control Systems	1 course unit
ENG 354/Control Systems Laboratory	.5 course unit
FIN 201/Fundamental Financial Methods	.5 course unit
MKT 201/Marketing Principles	.5 course unit
IDS 252/Society Ethics & Technology	1 course unit
MEC 495/Senior Project I	0 course unit
Mechanical Engineering or Management Elective*	1 course unit

Spring

ENG 098/Fundamentals of Engineering Review	0 course unit
ENG 312/Digital Circuits and Microprocessors	1 course unit
BUS 200/Legal Regulatory Environment	1 course unit
MEC 496/Senior Project II	1 course unit
Mechanical Engineering or Management Elective*	1 course unit
Liberal Learning Elective*	1 course unit

Total course units**39 course units ****

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Mechanical Engineering Electives

MEC 343/Biomechanics
 MEC 371/Thermodynamics II
 MEC 411/Heat Transfer
 MEC 421/Kinematics and Mechanisms
 MEC 431/Mechanical Design Analysis II
 MEC 441/Vibration Analysis
 MEC 453/Digital Control Systems
 MEC 465/Aerodynamics
 MEC 471/Compressible Fluid Mechanics
 MEC 481/Advanced Strength of Materials
 MEC 483/Robotics
 MEC 492/Independent Study
 ENG 470/Special Topics in Engineering
 ENG 412/Process and Quality Control

Bachelor of Science in Engineering Science—Policy and Society Specialization**First Year****Fall**

CHE	201/General Chemistry I	1 course unit
ENG	142/Fundamentals of Engineering Design	
	<i>or</i>	
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

Spring

CSC	215/Computer Science I	
	<i>or</i>	
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

*By advisement only.

Sophomore Year**Fall**

ECO	101/Principles of Microeconomics	1 course unit
ENG	212/Circuits Analysis	1 course unit
ENG	214/Circuits Analysis Laboratory	.5 course unit
ENG	222/Statics	1 course unit
ENG	232/Manufacturing Processes	1 course unit
ENG	272/Advanced Engineering Mathematics I	1 course unit

Spring

ENG	152/Engineering Material Science	1 course unit
ENG	262/Dynamics	1 course unit
ENG	312/ Digital Circuits and Microprocessors	1 course unit
MAT	229/Multivariable Calculus	1 course unit
	Policy and Society Elective*	1 course unit

Junior Year**Fall**

ENG	093/Engineering Seminar III	0 course unit
ENG	342/Advanced Engineering Mathematics II	1 course unit
MEC	321/Numerical Analysis	1 course unit
ENG	372/Engineering Economy	1 course unit
	Engineering Elective*	1 course unit
	Policy and Society Elective*	1 course unit

Spring

ENG	094/Engineering Seminar IV	0 course unit
ENG	452/Project Management	1 course unit

IDS	252/Society, Ethics, and Technology	1 course unit
	Engineering Electives*	2 course unit
	Liberal Learning Elective*	1 course unit

*By advisement only.

Summer

POL	399/Internship in Public Affairs	1 course unit
	OR	
POL	401/TCNJ Washington Internship	1 course unit
POL	402/TCNJ Washington Coursework	1 course unit
POL	403/TCNJ Washington Leadership Seminar	1 course unit

Students pursuing this option must take at least one Political Science course as part of their Policy and Society electives before their senior year.

Senior Year

Fall

ELC	495/Senior Project I	.5 course unit
ENG	099/Senior Professional Seminar	0 course unit
ENG	322/Thermodynamics I	1 course unit
	Policy and Society Electives*	2 course unit

Spring

ELC	496/Senior Project II	.5 course unit
ENG	098/Fundamentals of Engineering Review	0 course unit
ENG	352/Control Systems	1 course unit
ENG	354/Control Systems Laboratory	.5 course unit
	Policy and Society Elective*	2/0 course unit
	Liberal Learning Elective*	1 course unit

Total course units

39 course units**

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**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.

Engineering Electives

3 CU - At least 2 CU must be of the same course prefix (ELC or MEC).

ENG 348/Systems Engineering	(0.5)
ELC 251/Electronics	(1)
ELC 333/Electronics Laboratory	(0.5)
ELC 321/Systems & Signals	(1)
ELC 341/Communication Systems	(1)
ELC 343/Microcomputer Systems	(0.5)
ELC 423/Digital Signal Processing	(1)
MEC 251/Strength of Materials	(1)
MEC 263/Mechanical Engineering Lab. I	(0.5)
MEC 311/Mechanical Design Analysis I	(1)
MEC 361/Fluid Mechanics	(1)
MEC 421/Kinematics	(1)

Policy and Society Electives

4 or 6 CU - At least 2 CU must be at the 300 level or above.

PHL 275/Philosophy of Law	(1)
BUS 200/Legal and Regulatory Environment of Business	(1)
BUS 300/Law for Business	(1)

BUS 360/International Business Law	(1)
ECO 102/Principles of Macroeconomics	(1)
ECO 345/Comparative Economic Systems	(1)
POL 320/Constitutional Law	(1)
POL 321/Civil Liberties	(1)
POL 380/International Political Economy	(1)
POL 355/Political Economy of Natural Resources	(1)
POL 305/American Public Policy	(1)
POL 200/Political Analysis	(1)
SOC 345/Inequality, Pollution and the Environment	(1)
HIS 176/American Technology	(1)
POL 230/International Relations	(1)
POL 250/Politics and Society in Developing Countries	(1)
POL 316/Public Opinion, Voting and Elections	(1)
PHL 240/Political Philosophy	(1)
SOC 355/Introduction to Urban Planning	(1)
SOC 336/Cultural and Social Change	(1)
ANT 341/Environmental Anthropology	(1)
ANT 340/Social Change in Latin America	(1)

Seven-Year BS (Engineering Science – Electrical Preference)/MD

Freshman Year

Summer

PHY 201/General Physics I*	1 course unit
PHY 202/General Physics II*	1 course unit

Fall

CHE 201/General Chemistry I	1 course unit
ENG 142/Fundamentals of Engineering Design	1 course unit
ENG 095/Introduction to Engineering	0 course unit
ENG 091/Engineering Seminar I	0 course unit
FSP First Seminar	1 course unit
ENG 222/Statics	1 course unit
ENG 272/Advanced Engineering Mathematics I	1 course unit

Spring

BIO 201/Foundations of Biological Inquiry	1 course unit
CHE 202/General Chemistry II	1 course unit
ENG 092/Engineering Seminar II	0 course unit
MAT 229/Multivariable Calculus	1 course unit
ENG 262/Dynamics	1 course unit
CSC 215/Computer Science I	1 course unit

Sophomore Year

Fall

ENG 232/Manufacturing Processes	1 course unit
ENG 342/Advanced Engineering Mathematics II	1 course unit
ENG 312/Digital Circuits and Microprocessors	1 course unit
ENG 093/Engineering Seminar III	0 course unit
ECO 101/Principles of Microeconomics	1 course unit
ENG 212/Circuits Analysis	1 course unit

Liberal Learning Elective**	1 course unit
Total course units at TCNJ	35.5 course units
<i>* Students entering the program must hold advanced placement credit in Calculus A and B. Alternatively, students must hold advanced placement credit for General Physics I and II, and complete Calculus A and B during the summer prior to their first semester at TCNJ.</i>	
<i>** By advisement only.</i>	
<i>***35.5 course units at TCNJ 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 35.5 course unit requirement.</i>	

Minor in Engineering Science

Option A—Mechanical Engineering

ELE 251/Electronics	1 course unit
ENG 212/Circuit Analysis	1 course unit
ENG 222/Statics	1 course unit
ENG 262/Dynamics	1 course unit
Engineering Elective*	1 course unit
Total course units	5** course units

** By advisement.*

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

Minor in Engineering Science

Option B—Civil Engineering

CIV 251/Strength of Materials	1 course unit
CIV 311/Structural Analysis	1 course unit
CIV 351/Structural Steel Design	1 course unit
ENG 222/Statics	1 course unit
Engineering Elective*	1 course unit
Total course units	5** course units

** By advisement.*

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