School of Engineering

Dean: Steven Schreiner; *Assistant Dean:* Martha H. Stella

The School of Engineering is composed of five departments: biomedical engineering, civil engineering, electrical and computer engineering, mechanical engineering, and technological studies. The School offers an interdisciplinary program in engineering science. Graduates of the engineering programs are prepared for employment at the professional level or to pursue graduate studies. The program in technological studies prepares students to be teachers of technology education.

Engineering Degree Programs

The School of Engineering offers the following engineering academic programs leading to a bachelor's degree:

- Bachelor of Science in Biomedical Engineering
- Bachelor of Science in Civil Engineering
- Bachelor of Science in Computer Engineering
- Bachelor of Science in Electrical Engineering
- Bachelor of Science in Engineering Science (Specialization in Engineering Management)
- Bachelor of Science in Mechanical Engineering
- Seven Year Medical/Bachelor of Science in Biomedical Engineering
- Seven Year Medical/Bachelor of Science in Engineering Science (Preferences in Electrical Engineering and Mechanical Engineering)

The School of Engineering offers the following engineering minors:

- Computer Engineering
- Electrical Engineering
- Engineering Science
- Mechanical Engineering

The Biomedical Engineering, Civil Engineering, Computer Engineering, Electrical Engineering, Engineering Science and Mechanical Engineering programs are accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org.

The engineering programs prepare students for careers in research and development, design, and engineering practice. The engineering programs equip graduates for entry-level positions as engineers in industry and place them on track for professional registration. The course of study in engineering will provide the opportunity to pursue an engineering specialty in one of the following engineering disciplines: biomedical, civil, computer, electrical, or mechanical engineering, or engineering management. The programs also prepare students for admission to graduate school to continue their education toward the MS or PhD degrees in a recognized engineering or other technical specialty, and other related advanced degrees.

The engineering curricula provide each student with a thorough understanding of why and how things work. They develop the ability to predict the effect on a proposed or existing design of different choices in the use of materials, form, and procedures. The curricula are built on a core of general studies taken from many disciplines and taught by experts in those specific fields of study. They are also firmly based on a study of fundamental concepts in mathematics and physical sciences and taught at a high level of intellectual challenge. The curricula provide exposure to the theory of engineering and design that underlies all engineering specialties, while offering the student the opportunity to explore a particular engineering specialty in depth.

The TCNJ engineering programs provide students with considerable exposure to laboratory experiences and are supported by excellent laboratory resources. Laboratory activities help develop skills in original design and develop a student's confidence in his or her ability to critique and improve a design. The engineering programs at TCNJ are limited to undergraduate studies. Laboratories, therefore, are designed specifically for teaching, are relevant to the course material, and are kept accessible for students.

Mission Statement

The mission of the School of Engineering is to develop highly competent professionals, preparing them for entry-level positions in engineering or teaching, or for further study in graduate or professional school. Allied with the College's mission, the School of Engineering is proud of its public service mandate to educate leaders of New Jersey and the nation, fostering intellectual growth of our students so that they may become productive citizens in the service of humanity. The School is dedicated to providing a dynamic learning environment that emphasizes open-ended design, problem-solving skills, teaming, communication, and leadership skills.

To accomplish its mission, the School of Engineering:

- offers a broad array of exceptional academic programs including: biomedical engineering, civil engineering, computer engineering, electrical engineering, mechanical engineering, engineering science (engineering management), and STEM education;
- engages students in creating innovative design solutions that include realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, sustainability, and global considerations, and disseminating these designs at national and regional venues;
- provides undergraduate research experiences, allowing students to work closely with members of the faculty; and
- employs highly dedicated faculty members who are effective teacher-scholars committed to maintaining a learner-centered undergraduate environment with emphasis on student mentoring.

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 permitted as long as enrollment limits are not exceeded.
- Graduation requires an in-major cumulative GPA of 2.0.

Biomedical Engineering

Faculty: Hall, *Chair,* BuSha, Wagner, Wei

Biomedical engineers integrate engineering skills with the understanding of the complexity of physiological systems, from the cellular level to the whole body, in order to improve healthcare. Biomedical engineers design instruments, devices, and develop computational models of physiological systems and signals. Some of the well established specialty areas within the field of biomedical engineering are: bioinstrumentation; biomaterials; biomechanics; cell and tissue engineering; medical imaging; rehabilitation engineering; and quantitative modeling of physiology. Biomedical engineers are employed in universities, in industry, in hospitals, in research facilities of educational and medical institutions, in teaching, and in government regulatory agencies.

Program Educational Objectives:

The biomedical engineering program has established the following educational objectives. These objectives outline what TCNJ biomedical engineers are expected to attain within the first few years after graduation.

- To contribute to the economic development of New Jersey, the nation and /or the global community 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 their chosen profession;
- To enhance career skills through life-long learning.

Student Outcomes:

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

Biomedical 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 on 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, economic, environmental 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.
- an understanding of biology and physiology, and the capability to apply advanced mathematics (including differential equations and statistics), science, and engineering to solve the problems at the interface of engineering and biology;
- the ability to make measurements on and interpret data from living systems, addressing the problems associated with the interaction between living and non-living materials and systems.

Bachelor of Science in Biomedical Engineering, Electrical Option

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

CHE	202/General Chemistry II	1 course unit
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)

Sophomore Year

Fall

BIO	185/Themes in Biology	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

BME	251/Fundamentals of Biomedical Engineering	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
TST	161/Creative Design	1 course unit
ECO	101/Principles of Microeconomics	1 course unit

Junior Year

Fall

BIO	211/Biology of the Eukaryotic Cell**	1 course unit
BME	311/Physiological Systems	1 course unit
BME	333/Physiological Systems Laboratory	.5 course unit
CHE	331/Organic Chemistry I	1 course unit
ENG	093/Engineering Seminar III	0 course unit
MAT	229/Multivariable Calculus	1 course unit

Spring

ENG	094/Engineering Seminar IV	0 course unit
ENG	322/Thermodynamics I	1 course unit
ENG	342/Advanced Engineering Mathematics II	1 course unit
ENG	352/Control Systems	1 course unit
BME	371/Physiological Systems II	1 course unit
IDS	252/Society, Ethics, and Technology	1 course unit

Senior Year

Fall

BME	423/Introduction to Biomaterials	1 course unit
ELC	423/Digital Signal Processing	1 course unit

ELC	433/Electrical Engineering Laboratory III	.5 course unit
ENG	099/Senior Professional Seminar	0 course unit
BME	495/Senior Project I	0 course unit
ENG	372/Engineering Economy	1 course unit
	Liberal Learning Elective*	1 course unit
	Biomedical Engineering Elective*	1 course unit

Spring

BME	473/Bioinstrumentation	1 course unit
BME	496/Senior Project II	1 course unit
ENG	098/Fundamentals of Engineering Review	0 course unit
	Engineering Elective (3xx or 4xx)*	1 course unit
	Liberal Learning Elective*	1 course unit
	Biomedical Engineering Elective*	1 course unit
Total course units		**39 course units**

**By advisement only.*
*** Students whose goal is admission to medical school can substitute a laboratory-based biology course in lieu of BIO 211 and must complete CHE 332/Organic Chemistry II in addition to program requirements*

Bachelor of Science in Biomedical Engineering, Mechanical Option

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

CHE	202/General Chemistry II	1 course unit
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)

Sophomore Year

Fall

BIO	185/Themes in Biology	1 course unit
ENG	212/Circuit Analysis	1 course unit
ENG	214/Circuit Analysis Laboratory	.5 course unit
ENG	222/Statics	1 course unit
ENG	272/Advanced Engineering Mathematics I	1 course unit

Spring

BME	251/Fundamentals of Biomedical Engineering	1 course unit
MAT	229/Multivariable Calculus	1 course unit
MEC	251/Strength of Materials	1 course unit
MEC	263/Mechanical Engineering Laboratory I	.5 course unit
TST	161/Creative Design	1 course unit
ECO	101/Principles of Microeconomics	1 course unit

Junior Year

Fall

BIO	211/Biology of the Eukaryotic Cell**	1 course unit
BME	311/Physiological Systems	1 course unit
BME	333/Physiological Systems Laboratory	.5 course unit
CHE	331/Organic Chemistry I	1 course unit
ENG	093/Engineering Seminar III	0 course unit
ENG	322/Thermodynamics I	1 course unit
IDS	252/Society, Ethics and Technology	1 course unit

*** Students whose goal is admission to medical school can substitute a laboratory-based biology course in lieu of BIO 211 and must complete CHE 332/Organic Chemistry II in addition to program requirements*

Spring

BME	343/Biomechanics	1 course unit
ENG	094/Engineering Seminar IV	0 course unit
ENG	342/Advanced Engineering Mathematics II	1 course unit
ELC	251/Electronics	1 course unit
ELC	333/Electrical Engineering Laboratory I	.5 course unit
BME	371/Physiological Systems II	1 course unit

Senior Year

Fall

BME	423/Introduction to Biomaterials	1 course unit
ENG	099/Senior Professional Seminar	0 course unit
MEC	311/Mechanical Design I	1 course unit
BME	495/Senior Project I	0 course unit
MEC	361/Fluid Mechanics	1 course unit
	Liberal Learning Elective*	1 course unit
	Biomedical Engineering Elective*	1 course unit

Spring

BME	473/Bioinstrumentation	1 course unit
BME	496/Senior Project II	1 course unit
ENG	372/Engineering Economy	1 course unit
ENG	098/Fundamentals of Engineering Review	0 course unit
	Liberal Learning Elective*	1 course unit
	Biomedical Engineering Elective*	1 course unit

Total course units **39 course units**

**By advisement only.*

Civil Engineering

Faculty: Horst, *Chair*, Al-Omaishi, Bechtel, Brennan, Krstic

Civil engineers plan, design, and supervise the construction of a wide variety of facilities essential to modern life. Projects include buildings, bridges, highways, mass transit systems, airports, tunnels, dams, flood controls, water and wastewater treatment plants, and offshore structures. The civil engineering program supports the following major areas of civil engineering: structural engineering, transportation engineering, water resources engineering, and geotechnical engineering. The program offers student laboratory activities in materials testing (structural), fluids measurements (water resources), and soils testing (geotechnical), CAD drafting, and surveying.

Program Educational Objectives

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

- To contribute to the economic development of the country through the practice of engineering or a related discipline;
- 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 make progress towards leadership roles in industry or public;
- To maintain career skills through life-long learning and be on the way towards achieving professional licensure.

Civil Engineering Program Outcomes

The program outcomes listed below are expected of all graduates of the civil engineering program. These outcomes outline what TCNJ civil engineering 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 School of Engineering educational objectives.

Civil 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;
- 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;
- Apply knowledge of mathematics through differential equations, calculus-based physics, chemistry, and at least one additional area of science, consistent with the program educational objectives;
- Conduct civil engineering experiments and analyze and interpret the resulting data;
- Design a system, component, or process in more than one civil engineering context;
- Explain basic concepts in management, business, public policy, and leadership;
- Apply knowledge of four technical areas appropriate to civil engineering;
- Explain the importance of professional licensure.

Bachelor of Science in Civil 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

CIV	211/Surveying	.5 course unit
CIV	213/CAD Laboratory	.5 course unit
ENG	152/Engineering Materials Science	1 course unit
ENG	222/Statics	1 course unit
ENG	272/Advanced Engineering Mathematics I	1 course unit
PHY	120/Introduction to Geology	1 course unit

Spring

CIV	251/Strength of Materials	1 course unit
CIV	263/Engineering Materials Laboratory	.5 course unit
ENG	262/Dynamics	1 course unit
MAT	229/Multivariable Calculus	1 course unit
ECO	101/Principles of Microeconomics	1 course unit

Junior Year

Fall

ENG	093/Engineering Seminar III	0 course unit
CIV	311/Structural Analysis	1 course unit
CIV	321/Numerical Methods	1 course unit
CIV	331/Soil Mechanics	1 course unit
CIV	333/Soil Mechanics Laboratory	.5 course unit
CIV	361/Fluid Mechanics	1 course unit
CIV	411/Transportation Engineering	1 course unit

Spring

ENG	094/Engineering Seminar IV	0 course unit
ENG	342/Advanced Engineering Mathematics II	1 course unit
CIV	351/Structural Steel Design	1 course unit
CIV	363/Fluid Measurement Laboratory	.5 course unit
CIV	371/Civil Engineering Materials	.5 course unit
CIV	385/Hydraulic Engineering and Hydrology	1 course unit
CIV	431/Foundation Engineering	1 course unit

Senior Year

Fall

IDS	252/Society, Ethics, and Technology	1 course unit
ENG	099/Senior Professional Seminar	0 course unit
ENG	372/Engineering Economy	1 course unit
CIV	381/Environmental Engineering	1 course unit
CIV	421/Reinforced Concrete Design	1 course unit
CIV	495/Senior Project I	.5 course unit
	Civil Engineering Elective*	1 course unit

Spring

ENG	098/Fundamentals of Engineering Review	0 course unit
CIV	451/Construction Management	1 course unit
CIV	496/Senior Project II	.5 course unit
	Civil Engineering Elective*	1 course unit
	Liberal Learning Elective*	1 course unit
	Liberal Learning Elective*	1 course unit

Total course units **39 course units**

**By advisement only.*

<u>Civil Engineering Electives</u>

CIV 441/Structural Steel Design II
CIV 443/Foundation Engineering II
CIV 445/Water Resources Engineering

CIV 446/Hydraulic Structure Design
CIV 461/Reinforced Concrete Design II
CIV 471/Transportation Engineering II
CIV 481/Structural Analysis II

Electrical and Computer Engineering

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

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 and be on the way towards achieving professional licensure.

Electrical and Computer Engineering Program Outcomes

The program 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 School of Engineering 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

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	310/Discrete Structures of Computer Science	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	260/Computer Science III	1 course unit
ELC	343/Microcomputer Systems	.5 course unit
ENG	093/Engineering Seminar III	0 course unit
ENG	222/Statics	1 course unit
ELC	451/Computer Arch. & Organization	1 course unit
ELC	363/Computer Engineering Lab 1	.5 course unit
IDS	252/Society, Ethics, and Technology	1 course unit
ENG	348/Systems Engineering	.5 course unit

Spring

ENG	094/Engineering Seminar IV	0 course unit
ENG	342/Advanced Engineering Mathematics II	1 course unit
ENG	352/Control Systems	1 course unit
ENG	354/Control Systems Laboratory	.5 course unit
ENG	372/Engineering Economy	1 course unit
	Liberal Learning Elective*	1 course unit

Senior Year

Fall

ELC	423/Digital Signal Processing	1 course unit
ELC	433/Signal Processing Laboratory	.5 course unit
ELC	411/Embedded Systems	1 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
ENG	322/Thermodynamics I	1 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
Total course units		**39 course units**

** By advisement only.*

Computer Engineering Electives

Any 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

At most one of the following:

CSC 350/Digital Computer Graphics
CSC 360/Networks
CSC 370/Stack Machines
CSC 380/Artificial Intelligence
CSC 390/Programming Languages
CSC 434/Compilers & Interpreters
CSC 446/Database Management Systems
CSC 485/Topics in Computer Science
ELC 483/Robotics
ELC 492/Independent Study
ENG 470/Special Topics in Engineering

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	310/Discrete Structures of Computer Science	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
ENG	222/Statics	1 course unit
ENG	348/Systems Engineering	.5 course unit
ELC	451/Computer Architecture and Organization	1 course unit
ELC	363/Computer Engineering Laboratory I	.5 course unit

	Liberal Learning 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	352/Control Systems	1 course unit
ENG	354/Control Systems Laboratory	.5 course unit
ENG	372/Engineering Economy	1 course unit

Senior Year

Fall

ELC	423/Digital Signal Processing	1 course unit
ELC	433/Signal Processing Laboratory	.5 course unit
ELC	411/Embedded Systems	1 course unit
ELC	495/Senior Project I	.5 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
ENG	322/Thermodynamics I	1 course unit
ENG	342/Advanced Engineering Mathematics II	1 course unit
ELC	441/Digital Systems Engineering	1 course unit
ELC	496/Senior Project II	.5 course unit
	Electrical Engineering Elective*	1 course unit
Total Course Units		**39 course units**

** By advisement only.*

<u>Electrical Engineering Electives</u>

<u>Any of the following:</u>

ELC 383/Electronics II
ELC 431/RF/Microwave Engineering
ELC 453/Digital Control Systems
ELC 471/VLSI Design
ELC 473/Bioinstrumentation
ELC 475/Advanced Digital Signal Processing

<u>At most one of the following:</u>

ELC 483/Robotics
ELC 492/Independent Study
ENG 470/Special Topics in Engineering

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.*

Engineering Science

Engineering science is an interdisciplinary program leading to a Bachelor of Science in Engineering Science with a specialization in engineering management. 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 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, communication skills, teamwork, understanding of contemporary global and socio-economic issues, and use of modern engineering tools;
- To maintain career skills through life-long learning and be on the way towards achieving professional licensure.

Engineering Science/Engineering Management Specialization

The engineering management specialization integrates engineering and management education to prepare students for engineering management. Graduates of this program are prepared to work as first-line supervisors or plant managers. This course of study provides students with the technical knowledge that first-line supervisors need along with expertise in accounting, finance, production, marketing, and personnel. It includes courses from the engineering programs and departments as well as the School of Business. Engineering management students must select either the electrical engineering or mechanical engineering preference for their studies.

Engineering Science/Engineering Management Specialization Program Outcomes

The program outcomes listed below are expected of all graduates of the engineering science/engineering management specialization 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 School of Engineering educational objectives.

Engineering science/engineering management specialization 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;
- 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.

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	
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

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

**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	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

BUS	200/Legal and Regulatory Environment of Business	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/Numerial 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	372/Engineering Economy	1 course unit
MGT	201/Managing in the 21st Century	.5 course unit
IDS	252/Society, Ethics, and Technology	1 course unit
	Liberal Learning Elective*	1 course unit

**By advisement only.*

Senior Year

Fall

ELC	495/Senior Project I	0 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
	Electrical Engineering Elective*	1 course unit

Spring

ELC	496/Senior Project II	1 course unit
ENG	098/Fundamentals of Engineering Review	0 course unit
ENG	452/Project Management	1 course unit
	Management Elective*	1 course unit
	Liberal Learning Elective*	1 course unit

Total course units	**39 course units**

**By advisement only.*

<u>Electrical Engineering Electives</u>

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 473/Bioinstrumentation
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	
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

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

** 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

ACC	201/Financial Accounting and Reporting	1 course unit
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 Calucus	1 course unit

Junior Year

Fall

BUS	200/Legal and Regulatory Environment of Business	1 course unit
ENG	093/Engineering Seminar III	0 course unit
ENG	322/Thermodynamics I	1 course unit
ENG	342/Advanced Engineering Mathematics II	1 course unit
MEC	321/Numerial Analysis	1 course unit
MKT	201/Marketing Principles	.5 course unit
IDS	252/Society, Ethics, and Technology	1 course unit

Spring

ENG	094/Engineering Seminar IV	0 course unit
ENG	372/Engineering Economy	1 course unit
MEC	251/Strength of Materials	1 course unit
MEC	263/Mechanical Engineering Laboratory I	.5 course unit
MGT	201/Managing in the 21st Century	.5 course unit
	Liberal Learning Elective*	1 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
MEC	311/Mechanical Design Analysis I	1 course unit
MEC	495/Senior Project I	0 course unit
	Mechanical Engineering Elective*	1 course unit

Spring

ENG	098/Fundamentals of Engineering Review	0 course unit
ENG	312/Digital Circuits and Microprocessors	1 course unit
ENG	452/Project Management	1 course unit
MEC	361/Fluid Mechanics	1 course unit
MEC	496/Senior Project II	1 course unit
	Management Elective*	1 course unit
Total course units		**39 course units**

** By advisement only.*

Mechanical Engineering Electives
MEC 343/Biomechanics
MEC 371/Thermodynamics II
MEC 411/Heat Transfer
MEC 421/Kinematics and Mechanisms
MEC 423/Intro to Biomaterials
MEC 431/Mechanical Design Analysis II
MEC 441/Vibration Analysis
MEC 453/Digital Control Systems
MEC 471/Compressible Fluid Mechanics
MEC 473/Bioinstrumentation
MEC 481/Advanced Strength of Materials
MEC 483/Robotics
MEC 492/Independent Study
ENG 472/Special Topics in Engineering
ENG 412/Process and Quality Control

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.*

Mechanical Engineering

Faculty: Sepahpour, *Chair*, Chang, Facas, Grega, Paliwal, Shih, Wang, Yan

The Department of Mechanical Engineering offers an academic program leading to a Bachelor of Science in Mechanical Engineering. The Mechanical Engineering program is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org.

This program encompasses course work in two areas of study: energy, which includes courses in thermodynamics, fluid mechanics, and heat transfer; and engineering design, with courses in strength of materials and mechanical design. The mechanical engineering degree allows for additional courses in a variety of specialized areas.

Encompassing the broadest of all engineering disciplines, the mechanical engineering program teaches students how to apply the principles of mechanics and energy to design anything from automobile engines to rocket engines and nuclear reactors. Mechanical engineers design and operate power plants and are concerned with the conversion of one form of energy to another. They also design heating, ventilating, and air conditioning systems to provide controlled conditions of temperature and humidity in homes, offices, commercial buildings, and industrial plants. Besides developing equipment and systems for refrigeration of foods and the operation of cold storage facilities, these engineers also are involved with the production of energy from alternative sources such as solar, geothermal, and wind.

Program Educational Objectives

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

- 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, communication skills, teamwork, understanding of contemporary global and socio-economic issues, and use of modern engineering tools;
- To maintain career skills through life-long learning and be on the way towards achieving professional licensure.

Mechanical Engineering Program Outcomes

The program outcomes listed below are expected of all graduates of the mechanical engineering program. These outcomes outline what TCNJ mechanical engineering 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 School of Engineering educational objectives.

Mechanical 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;
- 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;
- An ability to apply advanced mathematics through multivariate calculus and differential equations;
- Familiarity with statistics, linear algebra, and numerical methods;
- A knowledge of chemistry and calculus-based physics with depth in at least one of them; and
- An ability to work professionally on both thermal and mechanical systems areas including the design and realization of such systems.

Bachelor of Science in Mechanical Engineering

Freshman 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	1 course unit
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

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
ECO	101/Principles of Microeconomics	1 course unit

Spring

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	253/Mechanical Engineering Laboratory I	.5 course unit
IDS	252/Society, Ethics, and Technology	1 course unit

Junior Year

Fall

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

** By advisement only.*

Spring

ENG	094/Engineering Seminar IV	0 course unit
ENG	372/Engineering Economy	1 course unit
MEC	361/Fluid Mechanics	1 course unit
MEC	363/Mechanical Engineering Laboratory II	.5 course unit
MEC	371/Thermodynamics II	1 course unit
	Mechanical Engineering 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
MEC	411/Heat Transfer	1 course unit
MEC	433/Mechanical Engineering Laboratory III	.5 course unit
MEC	460/Finite Elements in Mechanical Design	1 course unit
MEC	495/Senior Project I	0 course unit
	Mechanical Engineering Elective*	1 course unit

Spring

ENG	098/Fundamentals of Engineering Review	0 course unit
ENG	312/Digital Circuits and Microprocessors	1 course unit
MEC	463/Mechanical Engineering Laboratory IV	.5 course unit
MEC	496/Senior Project II	1 course unit
	Mechanical Engineering Elective*	1 course unit
	Liberal Learning Elective*	1 course unit

Total course units	**39 course units**

** By advisement only.*

Mechanical Engineering Electives

*(Students must take at least one course from **Group A** and **Group B**).*

GROUP A - Mechanical Design
MEC 343/Biomechanics
MEC 421/Kinematics and Mechanisms
MEC 423/Introduction to Biomaterials
MEC 431/Mechanical Design Analysis II
MEC 481/Advanced Strength of Materials

GROUP B - Thermal Systems
MEC 451/Heating, Ventilating and Air Conditioning
MEC 461/Thermal Systems Design
MEC 471/Compressible Fluid Mechanics

GROUP C - Dynamic Systems and Others
MEC 381/Introduction to Mechatronics
MEC 441/Vibration Analysis
MEC 453/Digital Control Systems
MEC 473/Bioinstrumentation
MEC 483/Robotics
MEC 492/Independent Study
ENG 412/Process and Quality Control
ENG 452/Project Management
ENG 472/Special Topics in Engineering

Minor in Mechanical Engineering

Option A—Mechanical Design

ENG	222/Statics	1 course unit
ENG	262/Dynamics	1 course unit
MEC	251/Strength of Materials	1 course unit
MEC	311/Mechanical Design I	1 course unit
	Mechanical Engineering Elective*	1 course unit
Total course units		**5** course units**

** Mechanical engineering elective must be chosen from the following: MEC 343, MEC 421, MEC 431, MEC 481.*
*** Only one course unit taken as part of the student's major may also be counted toward the student's minor.*

Minor in Mechanical Engineering

Option B—Thermal Systems

ENG	222/Statics	1 course unit
ENG	322/Thermodynamics	1 course unit
MEC	361/Fluid Mechanics	1 course unit
MEC	411/Heat Transfer	1 course unit
	Mechanical Engineering Elective*	1 course unit
Total course units		**5** course units**

** Mechanical engineering elective must be chosen from the following: MEC 371, MEC 451, MEC 461, MEC 471.*
*** Only one course unit taken as part of the student's major may also be counted toward the student's minor.*

Seven Year Medical/Engineering

The School of Engineering offers a combined seven-year medical/engineering program in conjunction with the New Jersey Medical School (NJMS) of the University of Medicine and Dentistry of New Jersey (UMDNJ). Students in the program can pursue undergraduate studies leading to a Bachelor of Science in Biomedical Engineering or a Bachelor of Science in Engineering Science (preferences in Electrical Engineering and Mechanical Engineering are available). The Bachelor of Science in Biomedical Engineering and the Engineering Science programs are accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org.

Students in this program spend three years at TCNJ completing undergraduate coursework. Upon successful completion of the first year of medical school, the student is granted a Bachelor of Science in Biomedical Engieering or Bachelor of Science in Engineering Science from TCNJ. The MD degree is earned at the end of four years at NJMS.

For consideration into the program, the candidates must have earned a minimum SAT score of 1480 or better (from a single test), and hold a class rank within the top 5-10 percent. Students entering this program must hold advanced placement credit for Calculus A and Calculus B, and complete General Physics I and II in the summer prior to their first semester. Retention in the program requires students to carry an overall and semester GPA of 3.50 or higher and earn a B or better in the required science and engineering courses. Two interviews are required as part of the admissions process.

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 (Social Sciences)**	1 course unit
ENG	222/Statics	1 course unit
ENG	272/Advanced Engineering Mathematics I	1 course unit

** 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.*

*** By advisement only*

Spring

BIO	185/Themes in Biology	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	212/Circuits Analysis	1 course unit
ENG	214/Circuits Analysis Laboratory	.5 course unit
ENG	262/Dynamics	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
CSC	215/Computer Science I	1 course unit

Spring

ELC	251/Electronics	1 course unit
ELC	333/Electrical Engineering Laboratory I	.5 course unit
ELC	321/Signals and Systems	1 course unit
ENG	152/Materials Science	1 course unit
ENG	094/Engineering Seminar IV	0 course unit
ENG	322/Thermodynamics	1 course unit
IDS	252/Society, Ethics and Technology	1 course unit

Junior Year

Summer

CHE	331/Organic Chemistry I	1 course unit
CHE	332/Organic Chemistry II	1 course unit

Fall

ENG	352/Control Systems	1 course unit
ENG	354/Control Systems Laboratory	.5 course unit
ELC	495/Senior Project I	0 course unit
ENG	099/Senior Professional Seminar	0 course unit
BIO	231/Genetics	1 course unit
ELC	341/Communication Systems	1 course unit
	Electrical Engineering Elective**	1 course unit

Spring

ENG	372/Engineering Economy	1 course unit
TST	161/Creative Design	1 course unit
ELC	496/Senior Project II	1 course unit
ENG	098/Fundamentals of Engineering Review	0 course unit
	Liberal Learning Elective**	1 course unit
	Electrical Engineering Elective**	1 course unit

Total course units at TCNJ **33.5 course units**

** 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.*

*** By advisement only.*

Senior Year at New Jersey Medical School***

**** One Liberal Learning course requirement is met at New Jersey Medical School.*

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

First 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 (Social Sciences)**	1 course unit
ENG	222/Statics	1 course unit
ENG	272/Advanced Engineering Mathematics I	1 course unit

** 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.*

*** By advisement only.*

Spring

BIO	185/Themes in Biology	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	212/Circuits Analysis	1 course unit
ENG	214/Circuits Analysis Laboratory	.5 course unit
ENG	262/Dynamics	1 course unit

Sophomore Year

Fall

ENG	093/Engineering Seminar III	0 course unit
ENG	232/Manufacturing Processes	1 course unit
ENG	322/Thermodynamics	
ENG	342/Advanced Engineering Mathematics II	1 course unit
IDS	252/Society, Ethics and Technology	1 course unit
CSC	215/Computer Science I	1 course unit

Spring

ENG	152/Materials Science	1 course unit
TST	161/Creative Design	1 course unit
MEC	251/Strength of Materials	1 course unit
MEC	263/Mechanical Engineering Lab I	.5 course unit
MEC	361/Fluid Mechanics	1 course unit
ECO	101/Principles of Microeconomics	1 course unit
ENG	094/Engineering Seminar IV	0 course unit

Junior Year

Summer

CHE	331/Organic Chemistry I	1 course unit
CHE	332/Organic Chemistry II	1 course unit

Fall

ENG	352/Control Systems	1 course unit
ENG	354/Control Systems Laboratory	.5 course unit
ELC	495/Senior Project I	0 course unit
ENG	099/Senior Professional Seminar	0 course unit
MEC	311/Mechanical Design I	1 course unit
BIO	231/Genetics	1 course unit
	Mechanical Engineering Elective**	1 course unit

Spring

ENG	372/Engineering Economy	1 course unit
ELC	496/Senior Project II	1 course unit
ENG	098/Fundamentals of Engineering Review	0 course unit
ENG	312/Digital Circuits and Microprocessors	1 course unit
	Mechanical Engineering Elective**	1 course unit
	Liberal Learning Elective**	1 course unit

Total course units at TCNJ **33.5 course units**

** 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.*

*** By advisement only.*

Seven-Year BS in Biomedical Engineering (Electrical Preference)/MD

First Year

Summer

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

Fall

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 (Social Sciences)**	1 course unit
BIO	185/Themes in Biology	1 course unit
ENG	272/Advanced Engineering Mathematics I	1 course unit
TST	161/Creative Design	1 course unit

Spring

ENG	092/Engineering Seminar II	0 course unit
MAT	229/Multivariable Calculus	1 course unit
ENG	212/Circuits Analysis	1 course unit
ENG	214/Circuits Analysis Laboratory	.5 course unit
CSC	215/Computer Science I	1 course unit
IDS	252/Society, Ethics and Technology	1 course unit

BME	251/Fundamentals of Biomedical Engineering	1 course unit

Sophomore Year

Summer

CHE	201/General Chemistry I	1 course unit
CHE	202/General Chemistry II	1 course unit

Fall

BME	311/Physiological Systems	1 course unit
BME	333/Physiological Systems Laboratory	.5 course unit
ENG	312/Digital Circuits and Microprocessors	1 course unit
ENG	093/Engineering Seminar III	0 course unit
ENG	372/Advanced Engineering Math II	1 course unit
BIO	211/Eukaryotic Cell Biology	1 course unit
ECO	101/Principles of Microeconomics	1 course unit

Spring

ELC	321/Signals and Systems	1 course unit
ELC	251/Electronics	1 course unit
ELC	333/Electrical Engineering Laboratory I	.5 course unit
ENG	094/Engineering Seminar IV	0 course unit
BME	371/Physiological Systems II	1 course unit
ENG	372/Engineering Economy	1 course unit

Junior Year

Summer

CHE	331/Organic Chemistry I	1 course unit
CHE	332/Organic Chemistry II	1 course unit

Fall

ENG	099/Senior Professional Seminar	0 course unit
BME	423/Introduction to Biomaterials	1 course unit
ELC	423/Digital Signal Processing	1 course unit
ELC	433/Electrical Engineering Laboratory III	.5 course unit
ENG	322/Thermodynamics	1 course unit
ENG	352/Control Systems	1 course unit
ENG	495/Senior Project I	0 course unit
BME	4xx/Biomedical Engineering Elective	1 course unit

Spring

BME	473/Bioinstrumentation	1 course unit
ENG	098/Fundamentals of Engineering Review	0 course unit
BME	496/Senior Project II	1 course unit
BME	4xx/Biomedical Engineering Elective	1 course unit
	Engineering Elective (3xx or 4xx)	1 course unit
	Liberal Learning Elective**	1 course unit

Total course units at TCNJ **37**** course units**

Senior Year at New Jersey Medical School**

** Students entering the program must hold advanced placement credit in Calculus A and B, and complete General Physics I and II during the summer prior to their first semester at TCNJ.*
*** By advisement only. One Liberal Learning course requirement is met at New Jersey Medical School.*
****Total course units, including AP credit, are 39.*

Seven-Year BS in Biomedical Engineering (Mechanical Preference)/MD

Freshman Year

Summer

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

Fall

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 (Social Sciences)**	1 course unit
BIO	185/Themes in Biology	1 course unit
ENG	272/Advanced Engineering Mathematics I	1 course unit
ENG	212/Circuits Analysis	1 course unit
ENG	214/Circuits Analysis Laboratory	.5 course unit

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Spring

ENG	092/Engineering Seminar II	0 course unit
MAT	229/Multivariable Calculus	1 course unit
CSC	215/Computer Science I	1 course unit
ELC	251/Electronics	1 course unit
ELC	333/Electrical Engineering Laboratory I	.5 course unit
IDS	252/Society, Ethics and Technology	1 course unit
BME	251/Fundamentals of Biomedical Engineering	1 course unit

Sophomore Year

Summer

CHE	201/General Chemistry I	1 course unit
CHE	202/General Chemistry II	1 course unit

Fall

BME	311/Physiological Systems	1 course unit
BME	333/Physiological Systems Laboratory	.5 course unit
ENG	222/Statics	1 course unit
ENG	093/Engineering Seminar III	0 course unit
ENG	342/Advanced Engineering Math II	1 course unit
ECO	101/Principles of Microeconomics	1 course unit
BIO	211/Eukaryotic Cell Biology	1 course unit

Spring

ENG	094/Engineering Seminar IV	0 course unit
TST	161/Creative Design	1 course unit
MEC	251/Strength of Materials	1 course unit
MEC	263/Mechanical Engineering Lab I	.5 course unit
BME	371/Physiological Systems II	1 course unit
ENG	372/Engineering Economy	1 course unit

Junior Year

Summer

CHE	331/Organic Chemistry I	1 course unit
CHE	332/Organic Chemistry II	1 course unit

Fall

BME	423/Introduction to Biomaterials	1 course unit
MEC	311/Mechanical Design I	1 course unit
ENG	099/Senior Professional Seminar	0 course unit
ENG	322/Thermodynamics	1 course unit
MEC	361/Fluid Mechanics	1 course unit
BME	4xx/Biomedical Engineering Elective	1 course unit
BME	495/Senior Project I	0 course unit

Spring

ENG	098/Fundamentals of Engineering Review	0 course unit
BME	473/Bioinstrumentation	1 course unit
BME	343/Biomechanics	1 course unit
BME	496/Senior Project II	1 course unit
BME	4xx/Biomedical Engineering Elective	1 course unit
Liberal Learning Elective**		1 course unit
Total course units at TCNJ		**37*** course units**

Senior Year at New Jersey Medical School**

** Students entering the program must hold advanced placement credit in Calculus A and B, and complete General Physics I and II during the summer prior to their first semester at TCNJ.*
*** By advisement only. One Liberal Learning course requirement is met at New Jersey Medical School.*
**** Total course units, including AP credit, are 39.*