School of Engineering

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

The School of Engineering is composed of four departments: civil engineering, electrical and computer engineering, mechanical engineering, and technological studies; and two interdisciplinary programs: engineering science, and biomedical engineering. 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 for positions in business, industry, and government or 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 Civil Engineering
- Bachelor of Science in Computer Engineering
- Bachelor of Science in Electrical Engineering
- Bachelor of Science in Engineering Science (Specializations in Biomedical Engineering and Engineering Management)
- Bachelor of Science in Mechanical Engineering
- Bachelor of Arts in Biomedical Engineering
- Seven Year Medical/Bachelor of Science in Engineering Science (Preferences in Electrical Engineering and Mechanical Engineering)
- Seven Year Medical/Bachelor of Arts in Biomedical Engineering (Preferences in Electrical Engineering and Mechanical Engineering)

The School of Engineering offers the following engineering minors:

- Minor in Computer Engineering
- Minor in Electrical Engineering
- Minor in Engineering Science
- Minor in Mechanical Engineering

The Computer Engineering, Electrical Engineering, Engineering Science and Mechanical Engineering programs are accredited by the Engineering Accreditation Commission (EAC) of the Accreditation Board for Engineering and Technology (ABET).

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 engineering programs is to provide the student with a foundation in engineering and the underlying mathematics and sciences. The graduate of the engineering programs will have a mastery of engineering science and design which will enable him/her to pursue a successful career or continue graduate studies. This mission is achieved within the context of a comprehensive liberal arts college that emphasizes small classes and attention to individual needs.

Educational Objectives

The School of Engineering has established the following educational objectives for engineering programs. These objectives outline what TCNJ engineers should be able to accomplish during the first few years after graduation.

The School of 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, 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.

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–).
- 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.
- Transfer into the engineering programs from another program within the College is based upon the following performance standards in these "foundation courses": FSP-First Seminar (C+).
- Graduation requires a GPA of 2.0 in courses for the engineering programs. A student who has received two or more Ds or Fs in major courses will be subject to review by the departmental retention committee.

Civil Engineering

Faculty: Al-Omaishi, *Chair*, Horst, Krstic, Shenoda

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, geotechnical engineering, and construction engineering. The program offers student laboratory activities in materials testing (structural), fluids measurements (water resources), and soils testing (geotechnical), CAD drafting, and surveying.

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;
- Proficiency in mathematics through differentail equations; probability and statistics; calculus-based physics and chemistry;
- An ability to conduct laboratory experiments and to critically analyze and interpret data in more than one of the recognized major civil engineering areas;
- An ability to perform civil engineering design by means of design experiences integrated throughout the professional component of the curriculum;
- An understanding of professional practice issues such as procurement of work; bidding versus quality based selection processes; how the design professionals and the construction professions interact to construct a project; the importance of professional licensure and continuing education; and/or other professional practice issues;
- Proficiency in a minumum of four (4) recognized major civil engineering areas.

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

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

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
ENG	093/Engineering Seminar III	0 course unit
CIV	411/Transportation Engineering	1 course unit

Spring

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
ENG	094/Engineering Seminar IV	0 course unit
ENG	342/Advanced Engineering Mathematics II	1 course unit

Senior Year

Fall

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

Spring

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

Civil Engineering Electives
CIV 441/Structural Steel Design II
CIV 443/Geotechnical Engineering
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: Czeto, *Chair*, BuSha, Hernandez, Katz, Kurland, Riederer

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 (EAC) of the Accreditation Board for Engineering and Technology (ABET).

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 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;
- 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 analyze and design complex electrical and electronic devices; and
- An ability to analyze and design software and systems containing hardware and software components.

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

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

CSC	310/Discrete Structures of Computer Science	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

ENG	222/Statics	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
ECO	101/Principles of Microeconomics	1 course unit

Junior Year

Fall

CSC	340/Computer Science III	1 course unit
ELC	343/Microcomputer Systems	1 course unit
ENG	093/Engineering Seminar III	0 course unit
ENG	262/Dynamics	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

Spring

ENG	342/Advanced Engineering Mathematics II	1 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
	Liberal Learning Elective*	1 course unit

Senior Year

Fall

ELC	423/Digital Signal Processing	1 course unit
ELC	433/Electrical Engineering Laboratory III	.5 course unit
ELC	411/Embedded Systems	1 course unit
ELC	495/Senior Project I	0 course unit
ENG	099/Senior Professional Seminar	0 course unit
	Computer Engineering Elective*	1 course unit
	Liberal Learning Elective*	1 course unit

Spring

CSC	330/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	1 course unit
	Computer Engineering Elective*	1 course unit
Total course units		**39 course units**

** By advisement only.*

*** This course will be offered during the 2009-10 academic year and alternate years thereafter. Recommendation: on alternate years, students will complete CSC 330 and ELC 463 during the junior year in lieu of ENG 352/352, and fulfill the ENG 352/354 requirement during the senior year.*

Computer Engineering Electives

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 341/Communication Systems
ELC 383/Electronics II
ELC 441/Digital Systems Engineering
ELC 453/Digital Control Systems
ELC 471/VLSI
ELC 475/Advanced Digital Signal Processing
ELC 483/Robotics
ELC 492/Independent Study
ENG 472/Special Topics in Engineering

Minor in Computer Engineering

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

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

CSC	310/Discrete Structures of Computer Science	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

ENG	222/Statics	1 course unit
ELC	251/Electronics	1 course unit
ELC	321/Signals and Systems	1 course unit
ELC	333/Electrical Engineering Laboratory 1	.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	1 course unit
ENG	093/Engineering Seminar III	0 course unit
ENG	262/Dynamics	1 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	373/Electrical Engineering Laboratory II**	.5 course unit
ELC	361/Engineering Electromagnetics**	1 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/Electrical Engineering Laboratory III	.5 course unit
ELC	411/Embedded Systems	1 course unit
ELC	495/Senior Project I	0 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	1 course unit
	Electrical Engineering Elective*	1 course unit

Total Course Units **39 course units**

** By advisement only.*

*** These courses will be offered during the 2009-2010 academic year and alternate years thereafter. Recommendation: substitute ELC 341 with ELC 411 in the Fall semester and ELC 361 and ELC 373 with ELC 441 and ENG 342 on alternate years.*

Electrical Engineering Electives

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
ELC 483/Robotics
ELC 492/Independent Study
ELC 452/Project Management
ENG 472/Special Topics in Engineering

Minor in Electrical Engineering

ELC	251/Electronics	1 course unit
ELC	321/Systems and Signals	1 course unit
ENG	212/Circuit Analysis	1 course unit
ENG	312/Digital Circuits and Microprocessors	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 specializations in biomedical engineering and engineering management. The Engineering Science program is accredited by the Engineering Accreditation Commission (EAC) of the Accreditation Board for Engineering and Technology (ABET).

Engineering Science/Biomedical Engineering Specialization

Biomedical Engineering is that interdisciplinary field of study combining engineering with life sciences. The role of the biomedical engineer is to provide answers to problems arising from the study of living systems by employing the methodology and principles of engineering. Biomedical engineers may be called upon in a wide range of capacities: to design instruments, devices, and software; to model the mechanics of the body; to research materials acceptable to the body; or to conduct research needed to solve clinical problems. In this field, there is continual change and creation of new areas due to rapid advancement in technology; however, some of the well established specialty areas within the field of biomedical engineering are: biomaterials; biomechanics; cellular, tissue and genetic engineering; medical imaging; and modeling systems physiology. Students who enroll in this program will have the opportunity to follow one of two curricula options: electrical engineering or mechanical engineering.

Engineering Science/Biomedical Engineering Specialization Program Outcomes

The program 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 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.

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;
- 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 Engineering Science—Biomedical Engineering Specialization, Electrical Engineering 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

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/Introduction to 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	473/Bioinstrumentation	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	423/Introduction to Biomaterials	1 course unit
BME	492/Independent Study	1 course unit
BME	496/Senior Project II	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.*
*** 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 Engineering Science—Biomedical Engineering Specialization, Mechanical Engineering 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

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/Introduction to 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

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	473/Bioinstrumentation	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	423/Introduction to Biomaterials	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.*
*** 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*

Engineering Science/Engineering Management Specialization

Coordinators: Kurland, Shih

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

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

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.*

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 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

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

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.*

<u>Mechanical Engineering Electives</u>

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, Flynn, Grega, Hess, 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 (EAC) of the Accreditation Board for Engineering and Technology (ABET).

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.

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

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

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

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.*

Bachelor of Arts in Biomedical Engineering

Biomedical engineering is an interdisciplinary academic program that offers students the opportunity to pursue a Biomedical Engineering specialization under Engineering Science that leads to a Bachelor of Science degree as well as a Bachelor of Arts in Biomedical Engineering. Students who enroll in either the BA or BS program will have the opportunity to follow one of two curricula options: electrical engineering or mechanical engineering. Students who enroll in either the BA or BS program will have the opportunity to follow one of two curricula options: electrical engineering or mechanical engineering.

The biomedical engineering academic programs are designed to provide students the opportunity to pursue a technical education that spans engineering, life sciences and physical sciences. The Biomedical Engineering specialization under Engineering Science (BS) program is designed to provide students the opportunity to pursue a career as design biomedical engineers or graduate study in Biomedical Engineering. The BA program in Biomedical Engineering provides a technical education that also spans the social sciences and humanities. Students who choose the BA program value the analytical skills that the study of engineering provides but do not intend to practice as design engineers.

The BS program will be an excellent choice for students interested in pursuing research or design career opportunities in engineering, medical and pharmaceutical consulting firms and industries. The BA program will be an excellent choice for students interested in research or technical management positions within the pharmaceutical or medical industries, and regulatory government. Students in either program can also continue their education in engineering, biological sciences, medicine, dentistry, and allied health careers.

The BA program in biomedical engineering program is designed to meet medical school admission requirements. Although admission standards vary, most medical schools require one year of college level calculus, one year of general chemistry with lab, one year of general physics with lab, one year of general biology with lab, one year of organic chemistry with lab, and at least six courses of humanities and social sciences. The BA program in biomedical engineering program meets these requirements.

Bachelor of Arts in Biomedical Engineering—Electrical Engineering 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

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/Introduction to 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

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
ECO	101/Principles of Microeconomics	1 course unit
IDS	252/Society, Ethics, and Technology	1 course unit

Senior Year

Fall

BME	473/Bioinstrumentation	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
	Liberal Learning Elective*	1 course unit
	Social Science/Humanities Elective*	1 course unit

Spring

BME	423/Introduction to Biomaterials	1 course unit
BME	492/Independent Study	1 course unit
	Liberal Learning Elective*	1 course unit
	Free Elective	1 course unit
Total course units		**36 course units**

**By advisement only.*
*** Students whose goal is admission to medical school are strongly advised to take CHE 332/Organic Chemistry II and a laboratory based biology course instead of ENG 342 and BIO 211 respectively.*

Bachelor of Arts in Biomedical Engineering—Mechanical Engineering 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

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/Introduction to 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

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
ECO	101/Principles of Microeconomics	1 course unit

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
IDS	252/Society, Ethics, and Technology	1 course unit

Senior Year

Fall

BME	473/Bioinstrumentation	1 course unit
ENG	099/Senior Professional Seminar	0 course unit
MEC	311/Mechanical Design I	1 course unit
	Liberal Learning Elective*	1 course unit
	Social Sciences/Humanities Elective*	1 course unit

Spring

BME	423/Introduction to Biomaterials	1 course unit
MEC	361/Fluid Mechanics	1 course unit
	Liberal Learning Elective*	1 course unit
	Free Elective	1 course unit
Total course units		**36 course units**

**By advisement only.*

*** Students whose goal is admission to medical school are strongly advised to take CHE 332/Organic Chemistry II and a laboratory based biology course instead of ENG 342 and BIO 211 respectively.*

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 Engineering Science (preferences in Electrical Engineering and Mechanical Engineering are available) or a Bachelor of Arts in Biomedical Engineering. Students pursuing either degree must select a preference in Electrical or Mechanical Engineering. The Bachelor of Science in Engineering Science program is accredited by the Engineering Accreditation Commission (EAC) of the Accreditation Board for Engineering and Technology (ABET).

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 either a Bachelor of Science in Engineering Science or a Bachelor of Arts in Biomedical Engineering 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 1400 or better (from a single test), and hold a class rank within the top 10 percent. Students entering this program must hold advanced placement credit for Calculus A and Calculus B, or General Physics I and II. Retention in the program requires students to carry an overall and semester GPAof 3.4 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

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	321/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**

Senior Year at New Jersey Medical School***

** 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.*

**** 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

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	321/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**

Senior Year at New Jersey Medical School***

** 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.*

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

Seven-Year BA 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

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
BIO	185/Themes in Biology	1 course unit
ENG	272/Advanced Engineering Mathematics I	1 course unit

Spring

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
CSC	215/Computer Science I	1 course unit

Sophomore Year

Fall

CHE	331/Organic Chemistry I	1 course unit
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
ENG	312/Digital Circuits and Microprocessors	1 course unit
ENG	093/Engineering Seminar III	0 course unit
TST	161/Creative Design	1 course unit

Spring

CHE	332/Organic Chemistry II	1 course unit
ELC	321/Signals and Systems	1 course unit
ELC	251/Electronics	1 course unit
ELC	333/Electrical Engineering Laboratory I	.5 course unit
BME	251/Introduction to Biomedical Engineering	1 course unit
ENG	094/Engineering Seminar IV	0 course unit
IDS	252/Society, Ethics and Technology	1 course unit

Junior Year

Fall

ENG	099/Senior Professional Seminar	0 course unit
BME	473/Bioinstrumentation	1 course unit
ELC	423/Digital Signal Processing	1 course unit
ECO	101/Principles of Microeconomics	1 course unit
ELC	433/Electrical Engineering Laboratory III	.5 course unit
BIO	321/Genetics	1 course unit
ENG	322/Thermodynamics	1 course unit

Spring

BME	423/Introduction to Biomaterials	1 course unit
BME	492/Independent Study	1 course unit
ENG	352/Control Systems	1 course unit
	Liberal Learning Elective**	1 course unit
Total course units at TCNJ		**32 course units**

Senior Year at New Jersey Medical School***

** 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.*

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

Seven-Year BA 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

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
BIO	185/Themes in Biology	1 course unit
ENG	272/Advanced Engineering Mathematics I	1 course unit

Spring

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
CSC	215/Computer Science I	1 course unit

Sophomore Year

Fall

CHE	331/Organic Chemistry I	1 course unit
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
ENG	222/Statics	1 course unit
ENG	093/Engineering Seminar III	0 course unit
IDS	252/Society, Ethics and Technology	1 course unit

Spring

CHE	332/Organic Chemistry II	1 course unit
ENG	322/Thermodynamics	1 course unit
BME	251/Introduction to Biomedical Engineering	1 course unit
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

Junior Year

Fall

BME	473/Bioinstrumentation	1 course unit
MEC	311/Mechanical Design I	1 course unit
ECO	101/Principles of Microeconomics	1 course unit
BIO	321/Genetics	1 course unit
ENG	099/Senior Professional Seminar	0 course unit

Spring

BME	423/Introduction to Biomaterials	1 course unit
BME	343/Biomechanics	1 course unit
MEC	361/Fluids	1 course unit
ELC	251/Electronics	1 course unit
ELC	333/Electrical Engineering Laboratory I	.5 course unit

Liberal Learning Elective**	1 course unit
Total course units at TCNJ	**32 course units**

Senior Year at New Jersey Medical School***

** 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.*

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