

Engineering Science

Faculty: Adegbege, Program Coordinator

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

Program Educational Objectives

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

- To contribute to the technical, societal, and/or economic development of New Jersey and the nation through the ethical practice of engineering and related fields;
- To become successful in their chosen career path, whether it is in the practice of engineering, in advanced studies in engineering or science, or in other complementary disciplines;
- To assume leadership roles in industry or public service;
- To maintain career skills through life-long learning.

Engineering Science Student Outcomes

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

Engineering science graduates will have:

- (1) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- (2) An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
- (3) An ability to communicate effectively with a range of audiences.
- (4) An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
- (5) An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
- (6) An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

- (7) An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Academic Policies and Standards

A student may repeat any course without seeking approval. However, if a student wishes to repeat a course more than once, permission must be obtained from the chair of the department or coordinator of the program of study and, if appropriate, the chair of the department offering the course. Permission to repeat a major course more than once will be granted only in cases of extreme extenuating circumstances, e.g., illness, financial, etc. 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 degree in engineering science are required to take the Fundamentals of Engineering Examination for the Professional Engineer's License.

Given the nature of the engineering curricula, it is extremely important to follow the recommended course sequence. Violations of this guideline may delay time to graduation.

Program Entrance, Retention, and Exit Standards

Every major program at the College has set standards for allowing students to remain in that program, to transfer within the College from one program to another, and to graduate from a program. The following are the standards for engineering majors. Minimum grades are noted in parentheses.

- Retention in the engineering programs is based on the following performance standards in these "critical content courses": PHY 201 (C-); MAT 127 (C-), MAT 128 (C-). A student who does not achieve these minimum performance standards, earns a grade of F, and/or has a cumulative GPA of less than 2.0 will be placed on the Engineering Programs Academic Warning List. Placement on the Engineering Programs Academic Warning List for two consecutive semesters or three non-consecutive semesters will result in dismissal from the major. Students dismissed from the major may appeal for re-entry into the major.
- To ensure academic success, first year, sophomore, and first-semester junior students will not be permitted to take more than 4.5 course units unless they have a GPA of 2.75 or greater. Upper class students can register for 5.5 course units if they are in good academic standing.
- Entrance (internal transfer) into the engineering programs from another program within the College is based upon the following performance standards in these "foundation courses": PHY 201 (C); MAT 127(C). Students must also be in good academic standing. Students who have not completed these foundation courses will be admitted as a Pre-Major and must complete them by the following semester. Internal transfer within engineering programs will be considered as long as enrollment limits are not exceeded.
- Graduation requires an in-major cumulative GPA of 2.0.

Bachelor of Science in Engineering Science-Engineering Management Specialization**First Year****Fall**

CHE 201	General Chemistry I	1.0 course unit
MAT 127	Calculus A	1.0 course unit
PHY 201	General Physics I	1.0 course unit
FYS	First Year Seminar	1.0 course unit
ENG 144	Fundamentals of Engineering Design	0.5 course unit
ENG 095	Introduction to Engineering	0.0 course unit

Spring

MAT 128	Calculus B	1.0 course unit
PHY 202	General Physics II	1.0 course unit
CSC 217	Computer Science I Python	1.0 course unit

Or

CSC 220	CS 1: Computer Problem Solving	
ENG 145	Introduction to Engineering Science and Design	0.5 course unit

Sophomore Year**Fall**

ENG 212	Circuit Analysis	1.0 course unit
ENG 232	Manufacturing Processes	1.0 course unit
ENG 272	Advanced Engineering Mathematics I	1.0 course unit
ENG 152	Engineering Material Science	1.0 course unit
ENG 222	Statics	1.0 course unit

Spring

MAT 229	Multivariable Calculus	1.0 course unit
ENG 214	Circuits Analysis Laboratory	0.5 course unit
ECO 101	Principles of Microeconomics	1.0 course unit

Or

ECO 102	Principles of Macroeconomics	
MEC 251	Strength of Materials	1.0 course unit
ENG 262	Dynamics	1.0 course unit

Junior Year**Fall**

*	Engineering Elective I	1.0 course unit
ENG 322	Thermodynamics I	1.0 course unit
ENG 342	Advanced Engineering Mathematics II	1.0 course unit
MKT 201	Marketing Principles	0.5 course unit
MGT 201	Managing in the 21st Century	0.5 course unit
ENG 093	Engineering Seminar III	0.0 course unit

Spring

ACC 201	Financial Accounting and Reporting	1.0 course unit
*	Engineering Elective II	1.0 course unit
*	Core Elective	1.0 course unit
ENG 348	Systems Engineering	1.0 course unit
ENG 094	Engineering Seminar IV	0.0 course unit
*	Engineering Elective III	1.0 course unit

Senior Year**Fall**

ENG 352	Control Systems	1.0 course unit
FIN 201	Fundamental Financial Methods	0.5 course unit
ELC/MEC 495*	Senior Design Project I	0.5 course unit
IDS 252	Society, Ethics & Technology	1.0 course unit
*	Core Elective	1.0 course unit
ENG 099	Senior Professional Seminar	0.0 course unit

Spring

ENG 452	Project Management	1.0 course unit
ELC/MEC 496*	Senior Design Project II	0.5 course unit
ENG 354	Control Systems Laboratory	0.5 course unit
BUS 200	Legal and Regulatory Environment	1.0 course unit
*	Core Elective	1.0 course unit

Technical Electives

MEC 311	Mechanical Design Analysis I	1.0 course unit
<i>Or</i>		
ENG 312	Digital Circuits & Microprocessors	1.0 course unit
ELC 251	Electronics	1.0 course unit
<i>Or</i>		
MEC 361	Fluid Mechanics	1.0 course unit
ELC 411	Embedded Systems	1.0 course unit
<i>Or</i>		
MEC 371	Thermodynamics II	1.0 course unit
<i>Or</i>		
Any	Other Electives	

Technical Electives-Other

ELC 321	Signals and Systems	1.0 course unit
ELC 361	Engineering Electromagnetics	1.0 course unit
ELC 451	Computer Architecture	1.0 course unit
ELC/MEC 483	Robotics	1.0 course unit
MEC 343	Biomechanics	1.0 course unit
MEC 421	Kinematics and Mechanism	1.0 course unit
ELC/MEC 470	Special Topics (By Advisement)	1.0 course unit
ELC/MEC 391	Independent Study	0.5-1.0 course unit

*Engineering Elective-Students planning to enroll in MEC495/496 must follow the sequence MEC311-MEC361 for technical elective.

* Engineering Elective-Students planning to enroll in ELC495/496 must follow the sequence ENG312-ELC251 for technical elective.

Bachelor of Science in Engineering Science—Robotics Specialization**First Year****Fall**

CHE 201	General Chemistry I	1.0 course unit
MAT 127	Calculus A	1.0 course unit
PHY 201	General Physics I	1.0 course unit
FYS	First Year Seminar	1.0 course unit
ENG 144	Fundamentals of Engineering Design	0.5 course unit
ENG 095	Introduction to Engineering	0.0 course unit

Spring

MAT 128	Calculus B	1.0 course unit
PHY 202	General Physics II	1.0 course unit
CSC 220	CS I: Computer Problem Solving	1.0 course unit
ENG 145	Introduction to Engineering Science and Design	0.5 course unit

Sophomore Year**Fall**

ENG 212	Circuit Analysis	1.0 course unit
CSC 230	CS II: Computer Problem Solving	1.0 course unit
ENG 232	Manufacturing Processes	1.0 course unit
ENG 272	Advanced Engineering Mathematics I	1.0 course unit
ENG 222	Statics	1.0 course unit

Spring

MAT 229	Multivariable Calculus	1.0 course unit
MEC 251	Strength of Materials	1.0 course unit
ENG 262	Dynamics	1.0 course unit
CSC 270	Discrete Structures	1.0 course unit
ENG 214	Circuit Analysis Laboratory	0.5 course unit

Junior Year**Fall**

ENG 312	Digital Circuits & Microprocessors	1.0 course unit
MEC 311	Mechanical Design Analysis I	1.0 course unit
*	Core Elective	1.0 course unit
ENG 342	Advanced Engineering Mathematics II	1.0 course unit
ENG 093	Engineering Seminar III	0.0 course unit
ECO 101	Principles of Microeconomics	1.0 course unit

Spring

ELC 321	Signals and Systems	1.0 course unit
ELC 251	Electronics	1.0 course unit
MEC 381	Introduction to Mechatronics	1.0 course unit
ENG 348	Systems Engineering and Economy	1.0 course unit
ENG 352	Control Systems	1.0 course unit
ENG 094	Engineering Seminar IV	0.0 course unit

Senior Year**Fall**

*	Technical Elective I Intelligent Systems	1.0 course unit
MEC 483	Robotics	1.0 course unit
ELC/MEC 495*	Senior Design Project I	0.5 course unit
*	Core Elective	1.0 course unit
ENG 354	Control Systems Laboratory	0.5 course unit
ENG 099	Senior Professional Seminar	0.0 course unit

Spring

IDS 252	Society, Ethics & Technology	1.0 course unit
ELC/MEC 496	Senior Design Project II	0.5 course unit
*	Core Elective	1.0 course unit
*	Technical Elective II ECE or MEC	1.0 course unit

Technical Electives-Electrical Engineering

ELC 341	Communication Systems	1.0 course unit
ELC 383	Electronics II	1.0 course unit
ELC 411	Embedded Systems	1.0 course unit
ELC 423	Digital Signal Processing	1.0 course unit
ELC 480	Digital Video Processing and Compression	1.0 course unit

Technical Electives-Computer Engineering

ELC 451	Computer Architecture	1.0 course unit
ELC 470	Special Topics in ELC (By Advisement)	1.0 course unit
ELC 411	Embedded Systems	1.0 course unit
ELC 423	Digital Signal Processing	1.0 course unit
ELC 480	Digital Video Processing and Compression	1.0 course unit

Technical Electives-Mechanical Engineering

MEC 421	Kinematics and Mechanism	1.0 course unit
MEC 431	Mechanical Design Analysis II	1.0 course unit
MEC 460	Finite Elements in Mechanical Design	1.0 course unit
MEC 470	Special Topics in Mechanical Engineering	1.0 course unit

Technical Electives-Intelligent Systems

CSC 380	Artificial Intelligence	1.0 course unit
CSC 426	Machine Learning	1.0 course unit
CSC 355	Human Computer Interaction	1.0 course unit
ELC 435	Artificial Neural Networks	1.0 course unit