SAET - Eng. Edu. Division (SEED)

On November 9, 2018, NJIT launched its newest school, the School of Applied Engineering and Technology (SAET), within the university's Newark College of Engineering (NCE). SAET encompasses NCE's applied programs in four divisions: the Electrical and Mechanical Engineering Technology Division (SEMD), the Built Environment Division (SBED), the Engineering Education Division (SEED), and the Biomedical & Life Sciences Division (SBLD). SAET serves about 1,000 NJIT students. The SAET offers a Bachelor of Science (BS) in Engineering Technology with five different concentrations. In addition, SAET offers BS degrees in Construction Engineering Technology (CET), Concrete Industry Management (CIM), Electrical and Computer Engineering Technology (ECET), Industrial Engineering Technology (IET), Mechanical Engineering Technology (MET), and Surveying Engineering Technology (SET). SAET also offers a BS degree in General Engineering (GEN) with five different concentrations, a Master of Science (MS) in Engineering Science (ESC), and a doctoral degree (PhD) in ESC.

The Engineering Education Division (SEED) consists of the Bachelor of Science (BS) in Engineering Technology with concentrations in Applied Engineering Technology, Biomedical Engineering Technology (BMET), Construction Management Technology (CMT), Software and Data Engineering Technology (SDET), and Technology Education (TEED). In addition, SEED offers a BS degree in General Engineering (GEN) with a customized plan of study and concentrations in Chemical Processing, Engineering Innovation and Intellectual Property, Materials Manufacturing Systems, Mechatronics, and Quality and Reliability Engineering.

Many students choose to complete their freshman and sophomore years at a community college or a technical institute, and obtain an associate's degree in applied science from these institutions. It is strongly recommended that students talk to an academic advisor at NJIT while they are still pursuing their associate's degree. The academic advisor will explain the transfer process in detail as well as suggest elective courses that may be beneficial. Contact an advisor by calling the School of Applied Engineering and Technology at (973) 596-3228, or by email at EngineeringTechnology@njit.edu.

After being admitted to NJIT, students must meet with an academic advisor to discuss the curriculum and any special interests the student might have. Students who lack necessary courses will be assigned bridge courses to make up the required prerequisites. Generally, courses taken at the freshman and sophomore level at the community colleges cannot substitute for junior or senior NJIT engineering technology courses. Engineering technology is that part of the technological field which requires the application of scientific and engineering knowledge and methods, combined with technical skills, for the implementation and extension of existing technologies. Engineering technology education focuses on preparing engineering technologists for positions that involve product development and improvement, system development, management, manufacturing and engineering operational functions. Graduates also enter the technical sales and customer services field, or continue in graduate work in engineering or management. Placement of graduates has been excellent.

NJIT Faculty

B

Barnes, William, Associate Professor

Brateris, Daniel J., University Lecturer

E

English, Robert, Professor Emeritus

J

Juliano, Thomas, Associate Professor

K

Khader, Michael, Associate Professor

L

Lieber, Samuel C., University Lecturer

M

Mahgoub, Mohamed A., Assistant Professor

Miima, John B., Assistant Professor

P

Potts, Laramie, Associate Professor

R

Rabie, Mohammad A., University Lecturer

Rahman, Sahidur, University Lecturer

Rockland, Ronald H., Professor

S

Sengupta, Arijit, Associate Professor

W

Washington, David W, Associate Professor

Wiggins, John, Senior University Lecturer

Programs

- Engineering Technology - B.S. (http://catalog.njit.edu/undergraduate/newark-college-engineering/saet-seed/engineering-technology/)
  - (http://catalog.njit.edu/undergraduate/newark-college-engineering/saet-seed/engineering-technology/)Concentrations
    - Engineering Technology, Biomedical Engineering Technology - B.S. **(**http://catalog.njit.edu/undergraduate/newark-college-engineering/saet-sbld/biomedical-engineering-technology/**)**
    - Engineering Technology, Construction Management Technology - B.S. (http://catalog.njit.edu/undergraduate/newark-college-engineering/saet-sbed/construction-management-technology/)
    - Engineering Technology, Software and Data Engineering Technology - B.S (http://catalog.njit.edu/undergraduate/newark-college-engineering/saet-semd/software-and-data-engineering-computer-technology/)
    - Engineering Technology, Technology Education - B.S. (http://catalog.njit.edu/undergraduate/newark-college-engineering/saet-seed/technology-education/)
    - Engineering Technology, Applied Engineering Technology - B.S (http://catalog.njit.edu/undergraduate/newark-college-engineering/saet-seed/applied-engineering-technology/).
- General Engineering - B.S. (http://catalog.njit.edu/undergraduate/newark-college-engineering/interdisciplinary-engineering-science/bs/)
  - Concentrations
    - Chemical Processing **(**http://catalog.njit.edu/undergraduate/newark-college-engineering/interdisciplinary-engineering-science/bs-conc-chemical-processing/**)**
    - Engineering Innovation and Intellectual Property
    - Materials Manufacturing Systems
    - Mechatronics
    - Quality and Reliability Engineering

- Drones and Robotics (http://catalog.njit.edu/undergraduate/newark-college-engineering/saet-seed/drones-and-robotics-minor/)
- Engineering Innovation Minor (http://catalog.njit.edu/undergraduate/newark-college-engineering/saet-seed/engineering_innovation-minor/)
- Safety Engineering (http://catalog.njit.edu/undergraduate/newark-college-engineering/saet-seed/safety-engineering-minor/)

- Engineering Technology - B.S. (http://catalog.njit.edu/undergraduate/newark-college-engineering/saet-seed/engineering-technology/)
  - (http://catalog.njit.edu/undergraduate/newark-college-engineering/saet-seed/engineering-technology/)Concentrations
    - Engineering Technology, Applied Engineering Technology - B.S (http://catalog.njit.edu/undergraduate/newark-college-engineering/saet-seed/applied-engineering-technology/).
    - Engineering Technology, Biomedical Engineering Technology - B.S. **(**http://catalog.njit.edu/undergraduate/newark-college-engineering/saet-sbld/biomedical-engineering-technology/**)**
    - Engineering Technology, Construction Management Technology - B.S. (http://catalog.njit.edu/undergraduate/newark-college-engineering/saet-sbed/construction-management-technology/)
    - Engineering Technology, Software and Data Engineering Technology - B.S (http://catalog.njit.edu/undergraduate/newark-college-engineering/saet-semd/software-and-data-engineering-computer-technology/)
    - Engineering Technology, Technology Education - B.S. (http://catalog.njit.edu/undergraduate/newark-college-engineering/saet-seed/technology-education/)

- General Engineering - B.S. (http://catalog.njit.edu/undergraduate/newark-college-engineering/interdisciplinary-engineering-science/bs/)
  - Concentrations
    - Chemical Processing **(**http://catalog.njit.edu/undergraduate/newark-college-engineering/interdisciplinary-engineering-science/bs-conc-chemical-processing/**)**
    - Engineering Innovation and Intellectual Property
    - Materials Manufacturing Systems
    - Mechatronics
    - Quality and Reliability Engineering

ENGR 1. EngineeringElective. 3 credits, 3 contact hours (3;0;0).**

ENGR 101. Analytical Meth for Engr Appl. 4 credits, 6 contact hours (4.5;1.5;0).
Corequisites: MATH 110. This course provides foundation in analytical methods that are used by engineers through an application-oriented, hands-on introduction to engineering analytical methods.

ENGR 2. Engineering Elective. 3 credits, 3 contact hours (3;0;0).**

ENGR 203. Introduction to Remote Sensing Science & Technology. 3 credits, 4 contact hours (2;2;0).
Pre or Corequisites: BME 210 or BNFO 135 or CS 100 or CS 101 or CS 103 or CS 104 or CS 106 or CS 113 or CS 115 . This course provides an introduction to remote sensing (RS), emphasizing the techniques that are used to monitor the Earth's surface. It will introduce the fundamentals of electromagnetic radiation (EMR), principles and concepts of RS, and EMR measurement by air-and space-borne optical, thermal, radar and LiDAR instruments, as well as Unmanned Aerial Vehicles (UAVs). The main theme will be how qualitative and quantitative information from RS data are acquired, processed, analyzed and utilized.

ENGR 210. Career Planning Seminar for En. 1 credit, 1.5 contact hour (1.5;0;0).
Prerequisite: Sophomore Standing. This course aims at providing engineering students with multidisciplinary and career planning skills in a seminar environment with emphasis on career planning, resume writing, and interview skills.

ENGR 211. Professional Skills for Engineers I. 1 credit, 1 contact hour (1;0;0).
Restrictions: Engineering and Engineering Technology students with Sophomore or higher standing. This course is designed to provide engineering students with the career planning and professional skills needed to search for and secure employment, and succeed in their career. This course will include a variety of self-directed online learning modules and in-person required activities that address: Career planning Career Development Services (CDS) resources & events Marketing and communicating your value and skills through Resume, Cover Letter & Professional Networking Platforms Interviewing Skills Professional Correspondence Transitioning from NJIT to the workplace.

ENGR 215. Raster-based Geographic Information System. 3 credits, 3 contact hours (3;0;0).
Prerequisites: CS 100 or CS 106 or CS 101 or CS 115. The course will focus on the fundamentals of the raster data model for geospatial analysis, visualization, and report generation. Course topics include Geographic Information System (GIS) operations as buffer, overlay, classification techniques, sampling theory, map algebra, and cartographic principles for data visualization and interpretation. Students are required to have basic computer skills.

ENGR 220. Introduction to Manual Machining. 2 credits, 4 contact hours (0;4;0).
This course teaches the safe operation of manual machining equipment through structured hands-on activities. A significant portion of the course is dedicated to learning subtractive manufacturing, the industrial standard for the mass manufacture of products around the world. The skills learned in this course can be applied to fabricate durable components for design projects, research equipment, and extracurricular activities.

ENGR 221. Intro to CNC Machining. 2 credits, 4 contact hours (0;4;0).
Prerequisites: ENGR 220. This course teaches the safe operation of CNC machining equipment through structured hands-on activities. A significant portion of the course is dedicated to learning CAM software for fabrication of 2D and 3D parts. The skills learned in this course can be applied to fabricate durable components for design projects, research equipment, and extracurricular activities.

ENGR 222. Introduction to Wood Working. 1 credit, 2 contact hours (0;2;0).
This course teaches the safe operation of woodworking equipment, including band saw, table saw, drill press, sander, chop saw, and miter saw through structured hands-on activities. A significant portion of the course is dedicated to learning optimal workflow, tool selection, and equipment selection for building structures. Homework assignments are important for reinforcement of skills learned, and are flexible for students to complete guided or self-directed projects.

ENGR 223. Introduction to CNC Routing. 1 credit, 2 contact hours (0;2;0).
This course teaches the safe operation of a CNC router machine through structured hands-on activities. A significant portion of the course is dedicated to software for fabrication of 2D and 3D parts. Homework assignments are important for reinforcement of skills learned and are flexible for students to complete guided or self-directed projects.

ENGR 224. Introduction to Welding. 1 credit, 2 contact hours (0;2;0).
This course teaches the fundamental principles and skills needed to perform successful manual welding operations. Basic background information on metallurgy, weld types, welding technologies, and welding calculations are presented and studied. A portion of the instruction covers welding theory and workflow development while the remaining course time is dedicated to teaching and learning physical welding skills. Students must demonstrate welding proficiency during laboratory sessions and assessments to complete course requirements. Homework assignments are important for reinforcement of skills learned and are flexible for students to complete guided or self-directed projects.

ENGR 225. Introduction to Physical Metrology. 1 credit, 2 contact hours (0;2;0).
This course teaches the fundamental principles and instruments of physical metrology and the skills needed to perform successful inspection of basic mechanical components. Basic background information on engineering prints, dimensioning, and GD&T are presented. A portion of the instruction covers the interpretation of engineering prints while the remaining course time is dedicated to learning and practicing the skills of making physical measurements using metrology equipment and instruments. Automated metrology technologies such as vison measurement, laser measurement, structure light measurement, and CMM's will be introduced and discussed.

ENGR 290. Pers of the Grand Challenges. 1 credit, 1 contact hour (1;0;0).
Prerequisite: Approval of the Instructor and the Grand Challenges Program Director; sophomore or higher standing. The first step for aspiring students in becoming a grand challenges scholar. Seven engaging colloquia will be offered every fall semester. Faculty conducting research in a Grand Challenge Theme will present the colloquia with one faculty member presenting at each colloquium. At the conclusion of each faculty presentation, and in the weeks in-between the presentations, students will engage in an activity organized to focus on exploring a potential engineering solution, addressing societal impacts, and holding debates on differing perspectives.

ENGR 3. Engineering Elective. 3 credits, 3 contact hours (3;0;0).**

ENGR 301. Engineering Applications of Data Science. 3 credits, 4 contact hours (2;2;0).
Prerequisites: CS 100 or CS 101 or CS 106 or CS 113 or CS 115 or BME 210. Pre or Corequisites: MATH 225 or MATH 244 or MATH 279 or MATH 305 or MATH 333 or ECE 321 or IE 331 or MNET 315. Restriction: This course is intended for engineering majors. This is a course for junior level undergraduates in any engineering discipline focusing on the use of data science techniques to solve problems in engineering. We will first discuss the Python programming language and how it can be used to access, manipulate, explore, and visualize scientific datasets. We will discuss statistics and probability as it applies to engineering problems such as safety factors and probability of part failure; this includes conditional probability, probability distributions, hypothesis testing, and Bayesian inference. We will then discuss more advanced statistical models ("machine learning"), including linear and logistic regression, decision trees, and clustering. Possible applications of these methods will be demonstrated in such disciplines and topics as (but not limited to): chemical, mechanical and electrical engineering (optimization and controls), materials engineering (structure and property databases), biomedical engineering (medical diagnosis and medical imaging) and electrical and computer engineering (signal processing, target tracking, robotic navigation). Students will gain hands-on experience in implementing and utilizing these various methods through computational laboratory assignments and reports and a semester-long engineering design project.

ENGR 303. Photogrammetry and Aerial Photo Interpretation. 3 credits, 4 contact hours (2;2;0).
Prerequisites: CS 100 or CS 101 or CS 106 or SDET 101. Application of the physical science of optics as related to the use of aerial photos, to engineering and land surveying projects. Includes the necessary mathematics of photogrammetry and the process of designing and establishing the required data for proper acquisition of photogrammetric information.

ENGR 305. Reality Capture of the Built Environment. 3 credits, 4 contact hours (2;2;0).
Prerequisites: FED 101 or MET 103 or ARCH 156. This course will show students how to collect 3D point cloud data to develop digital models of the built environment. Students will get in-depth experiences on reality capture technologies and computer applications on the principles and practice of extracting information for Building Information Modeling (BIM) and Civil Information Modeling (CIM). Course exercises and projects are designed to enrich the students' understanding of the potential of this emerging technologies on both a practical and theoretical level. The principal software that we will be used is Computer Aided Design (CAD) and Geographic Information Systems (GIS).

ENGR 310. Co-op Work Experience I. 12 credits, 12 contact hours (0;0;12).
Pre or Corequisites: ENGR 211 or approval of department. Restrictions: Completion of 36 credits; Cumulative GPA 2.5; Approval of CDS. Cooperative Education and Internships. Students gain major-related work experience and reinforcement of their academic program. Mandatory participation in seminars and completion of a report.

ENGR 311. Co-op Work Experience - Summer. 1 credit, 1 contact hour (0;0;1).
Prerequisites: ENGR 211 or ENGR 210 or approval of department. Restrictions: Completion of 36 credits; Cumulative GPA 2.5; Approval of CDS. Cooperative Education and Internships. Students gain major-related work experience and reinforcement of their academic program. Mandatory participation in seminars and completion of a report.

ENGR 312. Professional Skills for Engineers II. 1 credit, 1 contact hour (1;0;0).
Prerequisites: ENGR 211. This course is designed to provide engineering students with the career planning and professional skills needed to search for and secure employment, and succeed in their career. This course will include a variety of self-directed online learning modules and in-person required activities that address - career planning, workplace ethics, technical communication, engineering research, emotional intelligence, leadership and group dynamics.

ENGR 320. Prototyping Essentials. 3 credits, 4 contact hours (2;2;0).
Prerequisites: MATH 111 or MATH 113 or MATH 138 or (MATH 110 and ENGR 101) or (MATH 107 and ARCH 156). This course introduces students to the fundamental skills, equipment, safety procedures, and theory required to prototype and test basic mechanical and electrical systems as part of the engineering and product design process. Students learn basic prototyping skills starting with hand tools and moving to computer-controlled cutting, shaping, and measurement equipment such as 3D printers, water jets, lasers, CMM's, mills, and lathes. Students learn to use software to design components, develop and interpret prints, and program fabrication and inspection machinery. Entrepreneurial concepts, budget, and economic factors associated with prototyping are discussed and examined. Laboratory exercises require students to design, model, fabricate, and validate components and systems. The course concludes with a final project requiring students to design and produce a physical project in the NJIT Makerspace.

ENGR 330. Applications of Microcontrollers and IoT devices. 3 credits, 4 contact hours (2;2;0).
Microcontrollers are an integral part of many modern technological devices. This course will familiarize students to microcontrollers and its exciting applications in the fields of Internet of Things (IoT) and Robotics using a project-based hands-on approach. The microcontroller will be used as a component part of a broader design activity to introduce students to coding, logic, and automation in the wider context of product design. Students will work on multiple mini-projects to integrate a programmable system into a prototype such as a heart monitor, step counter, electronic scoreboard or a food temperature probe. Overall, this course will provide a basic understanding of software design and coding, microcontroller interfacing with sensors, actuators, motors etc., and robotics. Students will also develop modeling and prototyping skills and will be inspired towards making and service-learning.

ENGR 340. Vector-based Geographic Information System. 3 credits, 4 contact hours (2;2;0).
Prerequisites: BME 210 or BNFO 135 or CS 100 or CS 101 or CS 103 or CS 104 or CS 106 or CS 113 or CS 115. This course, the second in the Geographic Information Systems (GIS) Specialization, will go in-depth on how to analyze vector spatial data and to use cartography techniques to communicate results. Topics include geometric and attribute descriptives of vector data models, vector topology, Entity Relational Diagrams, spatial queries using Structured Query Language (SQL) syntax, descriptive statistics, spatial analysis and visualization.

ENGR 350. Intellectual Property for Engineers. 3 credits, 4 contact hours (2;2;0).
Prerequisites: FED 101 or MET 103. Restrictions: Minimum of Junior Standing. Intellectual Property drives the realization of designs and the development of engineering businesses. This course covers the fundamental of intellectual property inclusive of patents, copyrights, trade-secrets, and trademarks. Students will learn how to apply this background directly to design work, communication of ideas, and how they are integrated in business.

ENGR 360. Geometric Dimensioning and Tolerancing and Applied Metrology. 3 credits, 4 contact hours (2;2;0).
Prerequisites: FED 101 or MET 103. Restrictions: Junior Standing. Geometric Dimensioning and Tolerancing (GD&T) provides a powerful communication tool in the engineering development process, from concept to realization. Understanding applied metrology enables engineers to design for measurement and inspection. This course covers the fundamental principles of GD&T and measurement tools/analysis methods. Students will learn how to apply this background directly to engineering development. Career options and industry credentialing will be reviewed and discussed.

ENGR 400. Multidisciplinary Engineering Design Project. 3 credits, 3 contact hours (3;0;0).
Prerequisites: Junior or Senior standing and approval of instructor and NCE Associate Dean for Academic Affairs. Students design, document, and build a project or portion of a larger system as part of a multidisciplinary project under the supervision of a faculty member. Deliverables include written engineering design requirements, standards and specifications, bill of materials, detailed drawings suitable for fabrication, and a demonstration of a fabricated, assembled, tested, and functional project. Additional requirements may be added by the instructor with approval of the NCE Associate Dean for Academic Affairs.

ENGR 410. Co-op Work Experience II. 12 credits, 12 contact hours (0;0;12).
Prerequisites: ENGR 310; Completed at least 9 credits after ENGR 310; Cumulative GPA 2.5; Approval of department; Approval of CDS. Cooperative Education and Internships. Students gain major-related work experience and reinforcement of their academic program. Mandatory participation in seminars and completion of a report.

ENGR 420. Remote Sensing of the Environment. 3 credits, 4 contact hours (2;2;0).
Prerequisites: ENGR 303. This course focuses on various aspects of remote sensing applications in the domain of natural resources. Students will have the opportunity to obtain hands-on experience through real-world applications of remote sensing technologies in the biosphere, the hydrosphere, the pedosphere, the atmosphere, and the built environment. Students will come out of this course with a mastery of a wide range of interpretation, measurement, environmental monitoring and mapping skills using remotely sensed data.

ENGR 423. Drone Science Fundamentals. 3 credits, 4 contact hours (3;1;0).
Restrictions: NCE students with senior standing and with instructor permission. This course will cover the fundamentals of quadrotor drone kinematics and dynamics, quadrotor sensor data analysis, linear and non-linear flight control, and motion planning for a single quadrotor. Students will be guided through the process of building a quadrotor drone, setting up the required flight control parameters and associated Hardware-In-The-Loop simulators, and using Python/C programming for basic single quadrotor motion planning algorithms. Students will also be guided through the preparation for the Federal Aviation Authority (FAA) Part 107 Certified Drone Pilot knowledge test.

ENGR 424. Robotics Science Fundamentals. 3 credits, 4 contact hours (3;1;0).
Prerequisites: BME 210 or CS 101 or CS 106 or CS 113 or CS 115. This hands-on course will cover experiments that elucidate the fundamentals of ground robots and robotic manipulators, sensor data analysis, linear and non-linear motion control, and motion planning for a ground robots and robotic manipulators. Student will be guided through the process of building such robots, setting up the required motion control parameters and associated Hardware-In-The-Loop simulators, and programming of sensor-based single and multi-robot motion planning algorithms.

ENGR 425. Advanced Manufacturing Rotation. 2 credits, 4 contact hours (1;3;0).
Restrictions: Minimum of senior standing. The course applies the principles learned in all technical courses to an Advanced Manufacturing environment. The student will rotate under the various manufacturing/metrology areas within an Advanced Manufacturing facility. Progress reports, oral presentation and a formal written report are required.

ENGR 430. Engineering for Quality and Reliability. 3 credits, 4 contact hours (2;2;0).
Prerequisites: FED 101 or MET 103. Restrictions: Senior Standing. Engineering for quality and reliability has become paramount to ensure realized products and processes are not only effective but safe. This course covers the fundamental principles and tools of quality and reliability engineering. Students will learn how to apply this background directly to engineering work in industry, government, and academic settings. Career options and industry credentialing will be reviewed and discussed.

ENGR 433. Remote Sensing Digital Image Processing. 3 credits, 4 contact hours (2;2;0).
Prerequisites: ENGR 303. This course introduces conceptual and practical aspects of digital image analysis from airborne and spaceborne earth-observing instruments, and provides up-to-date information on analytical methods used to analyze digital remote sensing data. The project-based course will emphasize the advanced techniques for remote sensing data processing and analysis. In-class exercises will give students hands-on experience in the fundamentals of digital image processing and information extraction techniques.

ENGR 440. Geographic/Land Information Systems. 3 credits, 4 contact hours (2;2;0).
Prerequisites: SET 200 or CE 200. This course focuses on learning the fundamentals of Geographic/Land Information Systems (GIS/LIS) and Multi-Purpose Cadastres. Topics on GIS emphasize GIS data models (vector versus raster) and database development for applications in diverse fields like criminal justice, economics, and infrastructure. Topics on LIS emphasize issues relating to the maintenance of geospatial land records. Students will learn practical skills on web-based mapping and GIS.

ENGR 480. Hydrographic Mapping. 3 credits, 4 contact hours (2;2;0).
Prerequisites: CE 200 or SET 200. This course builds on the core competencies introduced in "Introduction to Geomatics":. This course focuses on computer generated solutions for nautical charts and water boundary delineations using imaging, optical, LiDAR, and acoustic observations via marine, airborne, and space-based platforms; to understand marine surveying technology for solutions on environmental problems; develop skills and techniques to enhance, interpret, and analyze acoustic measurements using computer-based methods.

ENGR 491. Research and Independent Study I. 3 credits, 3 contact hours (3;0;0).
Prerequisites: Approval of the Instructor (Faculty Mentor) and the Grand Challenges Program Director Junior or higher standing. Restrictions: Junior or higher standing. Provides the student with an opportunity to work on a research project under the individual guidance of a faculty mentor associated with the Grand Challenges Scholars Program. A written report, or a research paper, or a final presentation is required for course completion.

ENGR 492. Research and Independent Study II. 3 credits, 3 contact hours (3;0;0).
Prerequisites: ENGR 491. Restrictions: Junior or higher standing, and Approval of the Instructor (Faculty Mentor) and the Grand Challenges Program Director. Provides the student with an opportunity to continue to work on a research project under the individual guidance of a faculty mentor associated with the Grand Challenges Scholars Program. Students may continue the work they started in ENGR 491 or can work on a different grand challenge with the same or different faculty mentor. A written report, or a research paper or a final presentation is required for course completion.

ENGR 493. Service Learning Experience for Engineers. 3 credits, 3 contact hours (3;0;0).
Prerequisites: ENGR 290. Restrictions: Junior or higher standing, and Approval of the Grand Challenges Program Director. Through service experiential learning, students will engage in acquiring a multi-cultural competency. A host of opportunities are available for fulfilling this competency: an experience will require prior approval of the GCSP Faculty Advisor and the Program Director. Students will be required to develop a plan in carrying out the experience. Potential opportunities include but are not limited to 1. An Engineers without Borders project, 2. An EPICS project, 3. A global internship or cooperative education experience that is voluntary (unpaid), and 4. A study abroad experience.

ESC 310. Work Experience I. 3 credits, 3 contact hours (0;0;3).

ET 101. Introduction to Engineering Technology. 0 credits, 2 contact hours (2;0;0).
This course introduces the student to engineering technology. Also included is an introduction to the various engineering technology options: Construction, Electrical and Computer, and Mechanical Engineering Technologies as well as Concrete Industry Management.

ET 400. Professional Engineer (PE) Preparation. 3 credits, 3 contact hours (3;0;0).
Restrictions: Senior standing. This course introduces students to the role and responsibility of a licensed Professional Engineer (PE). This includes the application process, preparing for the Fundamentals of Engineering (FE)-Other Disciplines exam, applying for Certification as an Engineer-In-Training (EIT), and subsequent steps towards becoming a PE. Career and professional development will also be discussed.

ET 450. Multidisciplinary Capstone Project. 3 credits, 4 contact hours (2;2;0).
Restrictions: Senior standing and department approval. This course allows engineering technology students from multiple disciplines to apply principles learned in all technical courses to a capstone project. Projects can be multidisciplinary or discipline specific and are developed by an individual or by small groups. The project must meet the requirements of the student's engineering technology program and course instructor. A formal written report and oral presentation and are required.

GEN 301. Applications of Microcontrollers and IoT devices. 3 credits, 4 contact hours (2;2;0).
Prerequisites: FED 101, CS 101 or CS 106 or CS 115 or BME 210. Microcontrollers are an integral part of many modern technological devices. This course will familiarize students to microcontrollers and its exciting applications in the fields of Internet of Things (IoT) and Robotics using a project-based hands-on approach. The microcontroller will be used as a component part of a broader design activity to introduce students to coding, logic, and automation in the wider context of product design. Students will work on multiple mini-projects to integrate a programmable system into a prototype such as a heart monitor, step counter, electronic scoreboard or a food temperature probe. Overall, this course will provide a basic understanding of software design and coding, microcontroller interfacing with sensors, actuators, motors etc., and robotics. Students will also develop modeling and prototyping skills and will be inspired towards making and service-learning.

GEN 491. Research Independent Study I. 3 credits, 3 contact hours (3;0;0).
Restriction: senior standing in general engineering. Provides the student with an opportunity to work on a research project under the individual guidance of a program faculty member.

GEN 492. Research Independent Study II. 3 credits, 3 contact hours (3;0;0).
Prerequisite: GEN 491. A continuation of GEN 491.