

TST 161/Creative Design

1 course unit

(fall and spring)

This is a foundational course that looks at the elements and principles of design as related to practical products, systems, and environments. It introduces students to the creative process practiced by artists, designers, and engineers, valuable to them as both future producers and consumers. Content includes thinking, drawing, and modeling skills commonly used by designers; development of a design vocabulary; the nature and evolution of technological design; the impacts of design on the individual, society, and the environment; patents and intellectual property; human factors; team design; and appropriate technology, risk analysis, and futuring techniques. Design problems are presented within real-world contexts, using field trips and outside speakers. Students complete a major design project, document their work through a design portfolio, and present their solutions before the class. Weekly critiques of class projects build fluency, confidence, and creativity.

TST 391/Independent Study in Technological Studies

variable course units

(fall and spring)

Prerequisites: Permission of instructor and department chair

Independent Study is for advanced students wishing to pursue a special area of interest. Topic developed in consultation with a faculty advisor.

ETE 111/Engineering Design

1 course unit

(annually-spring)

Introduces the student to the concepts of mechanical design through the use of solid modeling of machine and product elements, exercises in reverse engineering, and the design of a simple machine. The course endeavors to provide the student the experience of learning a concept by analysis (reverse engineering), giving form to this concept through 3-D modeling, and finally applying the concept(s) in a simple mechanical design.

ETE 131/Engineering Math

1 course unit

(fall and spring)

Prerequisite: Placement into MAT127

Includes a brief review of algebra, trigonometry, geometry, and Calculus A (differentiation and integration). The course will introduce the use of computational methods as a tool for engineering analysis. Computational methods will include Mathematica and MS Excel. Mathematical concepts to be covered include: numerical integration, multiple integrals, vector algebra, and differential equations. All mathematical topics will be tied to the solution of physical problems (the rocket equation, the RC circuit, spring-damper system, etc.). The course will also cover the analysis of experimental data and include the concepts of error analysis and standard deviation. This course meets endorsement requirements for Middle School Math

ETE 261/Multimedia Design

1 course unit

(fall and spring)

This course is intended to build upon knowledge and skills learned in TST 161/Creative Design. The main emphasis will be placed on understanding 2-D visual elements, compositional operations, and associated human factors principles. Students will be given design problems in page layout, photography, video production, and web-based media. They will also investigate the ethical standards of the profession through case studies, and study the various means of communication through visual images through history.

ETE 271/Structures and Mechanics

1 course unit

(fall and spring)

Prerequisites: MAT 127 or ETE 131, TST 161

This course is a synthesis of the primary concepts that are covered in the traditional mechanical engineering courses of Statics, Strength of Materials and Machine Design.

The lecture portion of the class contains ample real-world examples to illustrate the applicability of the STEM concepts being discussed. The course contains substantial hands-on activities in which students are instructed in the safe and effective use of materials and tools, including woodworking machines.

ETE 275/Mechanics and Materials Laboratory **1 course unit**

(annually-fall)

Co-requisite: ETE 271

This course builds upon the laboratory experience students gained in ETE 271 and the material covered in ETE 131/Engineering Math. Students get further instruction in the use of woodworking tools and learn the theory of cutting tools. The course moves on to machining techniques (lathe and mill) and includes projects that investigate optimal cutting speeds and feed speeds for various engineering materials. Additional projects cover tensile testing, the use of strain gages, sheet metal fabrication, plastics, composite materials and environmental effects.

ETE 281/Analog Circuits and Devices **1 course unit**

(annually-spring)

Prerequisite: MAT127 or ETE 131

This introductory course provides the student with an overview of the fundamental concepts of the science of electricity, electrical circuits and how electrical technologies have substantially influenced society. The course is lecture-based but requires the student to build and test a wide range of electrical circuits. The course will cover the use of the digital multimeter, variable power supply, function generator, and oscilloscope. Topics covered include conductors/insulators, Ohm's law, resistor networks, measurement (the use of digital multimeters), Kirchhoff's Laws, RC circuits, semiconductors (LEDs and diodes), transformers and rectifiers, transistors and 555 timers, DC motors.

ETE 341/Environmental and Biotechnology Systems **1 course unit**

(annually-spring)

Prerequisites: MAT 127 or ETE 131, ETE 271 or permission of instructor

This course introduces students to the world of environmental and biotechnology systems, at the intersection of the designed and natural worlds. Course content includes a number of critical broad concepts in contemporary technological studies including agricultural and genetic biotechnology, energy systems, sustainable design, analytical medical technologies, waste remediation and ethical issues. Lecture topics are supported by pertinent laboratory and field experiences.

ETE 361/Architectural and Civil Engineering Design **1 course unit**

(annually-spring)

Prerequisites: TST 161, ETE 271

This is an advanced course in the design of structures with an emphasis on understanding the historical and contemporary influence of designed objects on end users and society. Content includes key design themes from the Industrial Revolution to the present, architectural style, product development, civil engineering and structural analysis, and human factors. A Design (Style) Case Study is used to better understand the influence of human design on the individual, society, and the environment. A thematic approach is used to select some problems for this course.

ETE 365/Prototyping Laboratory **.5 course unit**

(annually-fall)

Co-requisites: ETE 111, ETE 271 or permission of instructor

This is an advanced laboratory course designed to give students hands-on experiences with a variety of modeling techniques, tools, and machines. Students will make a variety of products including a mockup model, appearance model and prototype model. The

experience is designed to develop the student's fabrication skills with advanced techniques to produce high quality models for product development.

ETE 371/Mechanical Systems Design

1 course unit

(annually-fall)

Prerequisites: ETE 111, ETE 271

This course combines the knowledge of the previous mechanical oriented courses and considers applications where the only possible engineering solution requires a combination of these mechanical engineering concepts. Some examples are HVAC systems, internal combustion engines, fuel cells, power plants, space vehicles, and automobiles. Examples of mechanical systems will be covered by means of case studies. Students will work in teams to solve a series of design problems. These design problems will require that the student teams apply the methodology of engineering analysis to iterate an optimal solution that satisfies multiple criteria (e.g., weight, size, cost, ease of assembly, recyclability, etc.)

ETE 381/Digital Electronics

1 course unit

(annually-fall)

Prerequisite: ETE 281

This course introduces the student to digital electronics as they are designed and used in modern electrical devices. This course covers the binary number system, Boolean algebra and basic digital logic circuits. The course then moves on to applications of digital circuits such as digital signal processing and digital process control. This course will also cover programming fundamentals using the C programming language and Mathematica. Some basic digital concepts covered include the use of AND, OR and NOT gates, flip-flops, counters, adders and shifters. Building on the basic digital logic concepts, microprocessors are discussed, as well as how they are used to achieve “state machines” or Stored Program Control.

ETE 385/Robotics and Controls Laboratory

.5 course unit

(annually-spring)

Prerequisite: ETE 381 or permission of instructor

This course extends the scope of the hands-on components experiences of ETE 281 and ETE 381. Control systems can be either analog or digital (or a mix of both). This course is primarily a lab course where students build a variety of analog and digital control circuits/systems. Analog controls include a basic understanding of transducers, as well as a variety of widely applicable control circuits that can be used technology education courses. Some analog circuit examples include effective uses of relays, DPDT switches and 555-timer chips. Students spend approximately 2/3 of the course time on digital controls & robotic systems, including NXT Lego kits and C-stamp microprocessor kits. Visual programming techniques are covered using the NXT Lego kits while structured “line” programming (in C-language) is done with the C-Stamp kits. Students are given the opportunity to build and test various electrical systems that introduce a wide range of electrical and electro/mechanical components such as optical encoders, sensors and actuators.

ETE 395/Senior Design Proposal

.5 course units

(annually-spring)

Prerequisite: Junior standing

This course is the prerequisite for ETE 495/Senior Design Project. This course will provide an in-depth coverage of the design process and assist students in defining a project to be implemented in ETE 495.

ETE 461/Manufacturing Systems

1 course unit

(annually-spring)

Prerequisites: ETE 275, ETE 365 or permission of instructor

This course challenges advanced students to design multi-step, automated production systems, including related elements of coordination, management, evaluation and continuous improvement. It documents the effects of mass production on individuals and society, and engages students with issues of economics, ethics and globalization.

ETE 470/Topics in Technological Studies **1 course unit**
(occasionally)

Prerequisites: Recommendation of faculty adviser, approval of department chair
Topics is an advanced course dealing with an emerging issue in technological studies.

ETE 492/Facilities Design and Management **1 course unit**
(annually-spring)

Prerequisite: Junior standing or permission of instructor

The course involves the design of technological facilities, selecting and specifying equipment, and planning for the management of that facility. Safety and working with students in a materials/tool/equipment environment is a key component of the course (New Jersey requires technology education certification for any teacher working with students in a materials laboratory setting). Using real-world design constraints from a selected school district, students design a facility to support a technological/pre-engineering studies program.

ETE 495 Senior Design Project **1 course unit**
(annually-spring)

Prerequisite: ETE 395

Senior Design Project is a culminating experience that provides the structure for students to further develop their design, problem solving and technical skills. Intended to come at the end of the program, students draw from their experiences to solve a major technical problem, including research, solution planning and development, testing and evaluation.