

## Technological Studies

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We live in a technological age. Technology is the study of the human quest for solutions. The impacts of technology on the individual, society, and environment are great. Society needs professionals who understand technological forces and are prepared to help people manage those forces. Students in either the technology education (secondary) or M/S/T (elementary) major study a variety of themes including historical and contemporary influence of designed objects on end users and society, design style, product development, human factors engineering, product modeling, problem-solving techniques, communication, computers, and robotics. Emphasis is placed on developing design problem-solving skills and understanding. Courses are conducted in one of the 10 modern laboratories housed in the School of Engineering.

Technology education (the study of the designed world) as a subject is a dynamic new teaching field reflecting the need for students to better understand their technological world through a design-based learning environment. New “Standards for Technological Literacy: Content for the Study of Technology” were published in 2000. The National Science Foundation (NSF), the American Association for the Advancement of Science (AAAS), and most recently the Technology for All Americans (TfAA) project have recognized technology education as a new field of study and as an important element of school reform. Continuing his commitment to providing New Jersey’s children with an education that enables them to succeed in the new economy, Governor James E. McGreevey signed Bill A2169, which makes technology education part of New Jersey’s core curriculum content standards (see standard #3 “Technological Literacy”).

Students in the Department of Technological Studies with a teacher-education specialty in either Technology Education or M/S/T receive provisional certification to teach in New Jersey schools. Most states recognize teacher candidates from this NCATE nationally accredited program. Students graduating from the program also take positions in business and industry such as manufacturing design and prototyping, industrial sales, training and development, or become entrepreneurs. Some students choose to pursue this program to prepare for positions in higher education, commerce, media, or government service.

### Entrance, Retention, and Graduation 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 programs in technological studies. Minimum grades are noted in parentheses:

- Retention in the technology education major is based on the following performance standards in these “critical content courses”: TST 171/Fundamentals of Technology (C+); and TED 280/Introduction to Teaching Technology Education (C+).
- Transfer to the technology education major from another program within the College is based upon the following performance standards in these “foundation courses”: TST 171/Fundamentals of Technology (C+); and TED 280/Introduction to Teaching Technology Education (C+).

- Retention in the M/S/T major is based on the following performance standards in these “critical content courses”: TST 171/Fundamentals of Technology (C+); and ELE 201/Child and Adolescent Development (C+).
- Transfer to the M/S/T major from another program within the College is based upon the following performance standards in these “foundation courses”: TST 171/Fundamentals of Technology (C+); and ELE 201/Child and Adolescent Development (C+).

### **Technology Education (ETTC) or M/S/T (ELST/ECST/DHST) Majors**

Candidates for a teacher-education certificate must have a 2.75 cumulative grade point average to successfully complete their teacher education program. They also must meet the state hygiene/physiology requirement, and pass the appropriate PRAXIS examination before the New Jersey State Department of Education will issue the appropriate certificate. Teacher-education candidates will receive a “certificate of eligibility with advanced standing” which requires a candidate to be provisionally certified for his or her first year of teaching. After one year of successful teaching, the candidate is eligible for a permanent certificate. The teacher candidate will also have to pay a fee during his or her first year of teaching. Students should consult with their departmental advisers in planning their academic program. These plans should take into account requirements for the major, general education, professional courses, and state certification.

### **Suggested Course Sequence**

#### **Technology Education—First Year**

|   |                         |
|---|-------------------------|
| FSP First Seminar                         | 1 course unit           |
| TST 111/Engineering Graphics              | 1 course unit           |
| TST 161/Creative Design                   | 1 course unit           |
| TST 171/Fundamentals of Technology        | 1 course unit           |
| TST 181/Structures and Mechanisms         | 1 course unit           |
| TST 191/Materials Laboratory              | .5 course unit          |
| WRI 102/Academic Writing (if not exempt)* | 1 course unit           |
| Science option                            | 1 course unit           |
| Select one of the following courses:      | 1 course unit           |
| STA 115/Statistics I or                   |                         |
| CSC 105/Visual Basics Applications or     |                         |
| MAT 127/Calculus A                        |                         |
| <b>Total for year</b>                     | <b>8.5 course units</b> |

*\*It is recommended that students exempted from this course take other liberal learning courses.*

#### **Elementary Education M/S/T (ELST) or Early Childhood Education M/S/T (ECST) or Deaf and Hard of Hearing M/S/T (DHST) with a Technology Specialization**

This interdisciplinary major integrates formal study in mathematics, science, and technology and consists of a common “core” with a “specialization” in one of the M/S/T disciplines. Students electing a technology specialization will complete 10 units of common core requirements including MAT 127/Calculus A, STA 115/Statistics, three approved science courses, TST 171/Fundamentals of Technology, TST 181/Principles of Structures and Mechanisms, TED 460/Integrated M/S/T for the Child/Adolescent Learner, and two M/S/T approved electives. The technology specialization consists of a

minimum of three additional units with one at the 300 level or higher selected from the following courses: TST 111/Engineering Graphics, TST 231/Electronic Control, TST 261/2-D Design, TST 281/Designing with Materials, TST 341/Biotechnical Systems, TST 351/Robotics, TST 361/3-D Design, or two laboratory courses (TST 191, TST 291, TST 381).

### **Suggested Course Sequence**

#### **M/S/T—Freshman Year**

|   |                |
|---|----------------|
| FSP First Seminar   | 1 course unit  |
| TST 161/Creative Design   | 1 course unit  |
| WRI 102/Academic Writing (if not exempted)*   | 1 course unit  |
| TST 171/Fundamentals of Technology  | 1 course unit  |
| TST 181/Structures and Mechanisms   | 1 course unit  |
| Science Option  | 1 course unit  |
| Multicultural Children's Literature   | 1 course unit  |
| Select two of the following courses:  | 2 course units |
| MAT 127/Calculus A and<br>STA 115/Statistics I or<br>MAT 128/Calculus B (by advisement) |                |

*\*It is recommended that students exempted from this course take another liberal learning course.*

**Total for year** **9 course units**

#### **Technology Minor**

The minor consists of five units:

|   |               |
|---|---------------|
| TST 171/Fundamentals of Technology              | 1 course unit |
| TST 181/Principles of Structures and Mechanisms | 1 course unit |

Select three of the following courses (at least one 300-level course)

TST 111/Engineering Graphics  
TST 231/Electronic Control  
TST 261/2-D Design  
TST 281/Designing with Materials  
TST 341/Biotechnical Systems  
TST 351/Robotics  
TST 361/3-D Design

**TST 111/Engineering Graphics** **1 course unit**  
(annually—spring)

The course is an introduction to the unique language and process used by modern industry to design and create new products. Students will develop an understanding of engineering design and an ability to use computer-aided design (CAD) software. Content includes: 3-D virtual modeling, the role of engineering design in product development, idea development and concurrent design, concept refinement, component engineering, and concept representation and presentation.

**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 171/Fundamentals of Technology**

**1 course unit**

(with laboratory)

(fall and spring)

This is an introductory course in the study of technology with primary emphasis on exploring and examining why and how humans design their world. An understanding and appreciation of technology and its impacts on people and society will be provided through lectures, demonstrations, discussions, and laboratory experiences using a design/problem-solving model involving a variety of tools, materials, and equipment.

**TST 181/Structures and Mechanisms**

**1 course unit**

(annually—spring)

*Prerequisite:* TST 171

This course is a study of two fundamental elements of our technological world: structures and mechanisms. It is an introduction to structural and mechanical systems, the underlying scientific principles and applications, and the techniques and skills used in the design and development of these systems. Emphasis is placed on knowledge and the understanding of how these systems impact society and on the development of skills to solve new problems with structural and mechanical systems.

**TST 191/Materials Laboratory**

**.5 course unit**

(laboratory)

(annually—spring)

*Prerequisites:* TST 111, TST 161, TST 171

This is an integrated laboratory experience for students to explore common material processing tools and machine practices. Through this course, students will apply and synthesize what they have learned in prerequisite and corequisite courses. Values of both capability and creativity will be stressed, as will the importance of safety and its relationship to materials processing.

**TST 231/Electronic Control**

**1 course unit**

(annually—fall)

*Prerequisite:* TST 171

The course focuses on electronic and electro-mechanical systems, including sensors, control and output devices, and the impacts of these systems on contemporary society. Students will be introduced to control logic, switching, timing and other control devices and systems, analysis of circuits, and use of instrumentation.

**TST 261/2-D Design**

**1 course unit**

(annually—spring)

*Prerequisite:* TST 161

This course is intended to build upon skills and experiences introduced in the Creative Design course. Students will gain a perspective on the historical and contemporary influence of the information age on the individual and society. 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, web-based media using current equipment and software, and an ethical case study will be carried out.

**TST 281/Designing with Materials** **1 course unit**

(annually—fall)

*Prerequisites:* TST 171, TST 191

This course is a study of materials and their characteristics and how technological processes are employed to change their form and/or properties in order to expand their usefulness in meeting human needs and wants. The focus of this course is on the materials (and their characteristics) that are utilized to construct and produce products that help solve our technological problems.

**TST 291/Control Laboratory** **.5 course unit**

(laboratory)

(annually—spring)

*Prerequisites:* TST 191, TST 231, TST 281

This laboratory course is designed to provide students with hands-on experiences with electronic control, mechanisms, structures, and materials through the design and development of integrated products. Systems theory is taught, and students compare, design, and apply open and closed control systems.

**TST 341/Biotechnical Systems** **1 course unit**

(annually—fall)

*Prerequisite:* TST 171

This course is a study of biotechnical systems and their role and impact within contemporary society. It examines humankind's manipulation and use of biological processes to provide products and services of use to us. Emphasis will be placed on developing teaching strategies and materials to teach about biotechnical systems in elementary, middle, and high school settings. The course is team taught with faculty from the Department of Biology.

**TST 351/Robotics** **1 course unit**

(annually—fall)

*Prerequisites:* TST 181, TST 231, TST 291

The course places emphasis on the study of microprocessor, electronic, and electro-mechanical systems used in robotics devices. Emphasis will be placed on locomotion, sensing, and programming control. Students will utilize programmable chips and microsystems including appropriate control languages and programming.

**TST 361/3-D Design** **1 course unit**

(annually—spring)

*Prerequisites:* TST 111, TST 261

This is an advanced course in technological design with primary 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, human factors engineering, product modeling, and evaluation. 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.

**TST 381/Prototyping Laboratory** **.5 course unit**

(laboratory)

(annually—spring)

*Prerequisites:* TST 191, TST 291

*Corequisite:* TST 361

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.

### **TST 391/Independent Study in Technological Studies**

**1 course unit**

(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 adviser.

### **TST 431/Designing Production Systems**

**1 course unit**

(annually—spring)

*Prerequisites:* TST 281, TST 291

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.

### **TST 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 issues in technological studies.

### **TST 495/Senior Design Project**

**1 course unit**

(independent research)

(annually—spring)

*Prerequisites:* TST 381, approved senior project proposal

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.

## **Professional Education Courses**

### **TED 280/Introduction to Teaching Technology Education**

**1 course unit**

(with clinical hours)

(annually—fall)

The course is an initial professional experience for technology teacher education candidates. Technology education (the study of the designed world) as a subject is a dynamic new teaching field reflecting the need for students to better understand their technological world through a design-based learning environment. New "*Standards for Technological Literacy: Content for the Study of Technology*" were published in 2000. The National Science Foundation (NSF), the American Association for the Advancement of Science (AAAS), and most recently the Technology for All Americans (TfAA) project have recognized technology education as a new field of study and as an important element of school reform. This introduction will include observations of classroom activities and school administrative functions, teaching small groups of

students, studying about selecting content for instruction and historical developments in the field. Student membership in ITEA and TEANJ is required.

**TED 380/Junior Professional Experience in Technology Education** **1 course unit**

(with clinical hours)

(annually—spring)

*Prerequisites:* TED 280, junior status, 2.5 GPA

This course is a systematic professional experience designed to develop knowledge and skills necessary for teaching technology education in secondary schools. Experiences in the schools will include formal observation of teaching, planning for teaching, modes of instruction, presenting lessons, teacher-pupil interaction analysis and, planning, management and control of a Technology Education classroom/laboratory. The weekly seminars will address these and other related issues including defining the role of and performing as a professional educator. Continued membership in ITEA and TEANJ is required.

**TED 391/Independent Study in Technology Education** **1 course unit**

(fall and spring)

*Prerequisites:* Permission of instructor and department chair

TED 391 is restricted to advanced students wishing to pursue a special area of interest. The topic will be developed in consultation with a faculty adviser.

**TED 460/Integrated M/S/T for Child/Adolescent Learner** **1 course unit**

(annually—spring)

*Prerequisites:* TST 171, TST 261

This course is an introduction to research and contemporary issues concerning the national focus on technological literacy. The course will deal with concepts of design-based inquiry, history, principles and processes of technology including engineering and the impact of technological activity on the individual, society, and the environment. The setting for the study of technological literacy and design-based inquiry will focus on initiating technological literacy starting at the elementary school level.

**TED 480/Content and Methods in Technology Education** **1 course unit**

(annually—fall)

*Prerequisite:* TED 380

TED 480 encompasses a general overview of curriculum and methodology in technology education. The course will emphasize development of instructional programs and materials, methodology, evaluation and facilities organization, and management in technology education. TED 480 also includes a Red Cross First Aid course. Continued membership in ITEA and TEANJ is required.

**TED 481/Seminar in Technology Education** **1 course unit**

(annually—fall)

*Corequisite:* TED 490

Planning for and analysis of student teacher's role in school and community. Assistance in preparing for postgraduate activities or further professional development activities. Individual and group assignments to strengthen student teacher's preparation. Additional emphasis is placed on understanding school support services, addressing strategies for educational change, preparing to enter and advance in the profession. Continued membership in the International Technology Education Association and the Technology Educators Association of New Jersey is required.

**TED 490/Student Teaching in Technology Education**

**2 course units**

(field experience)

(annually—fall)

*Prerequisites:* TED 380, 2.75 GPA

*Corequisites:* TED 480, TED 481

Student teaching during the senior year is carried out under direct supervision of public or private school teachers and a college supervisor. Experience includes observation, participation, and responsible teaching within the school along with familiarization with both the school management system and community makeup.

**TED 492/Facilities Design and Management**

**1 course unit**

(annually—spring)

*Prerequisite:* TED 490

TED 492 focuses on principles associated with the design and development of instructional facilities appropriate for the study of technology in schools. Emphasis will be placed on safety, organization and management, facilities and equipment layout, formal instructional areas, and applications of instructional technology. Investigation and evaluation of available resources used in the teaching of design and technology, including equipment, instructional modules, instructional media and other instructional materials, will be stressed.