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### Technological Studies

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*See also Technological Studies courses and Technology Education courses.*

We live in a highly technological age and the impacts of technology and engineering on the individual, society, and environment are great. Design, a fundamental aspect of technology & engineering, is central to our department's teacher preparation methods. The K-12 educational system, as well as society in general, needs professionals who understand the forces and impacts behind design processes and the habits of mind of designers. Our department coordinates two undergraduate teacher preparation programs: (i) Technology/pre-Engineering Education (Secondary) and (ii) Integrative-STEM (i-STEM) Education [K-6]. [STEM: Science, Technology, Engineering and Math]

Both undergraduate teacher preparation programs are integrative STEM-based programs, studying a variety of STEM content areas and educational methods. STEM content areas include the science and math behind design processes (for K-12 environment), historical and contemporary influence of designed objects, product development, human factors engineering, product modeling, problem-solving techniques, environmental and biotechnical systems, communications, electronics and computers, structures, mechanisms and robotics. Emphasis is placed on understanding and applying core STEM principles and i-STEM education methods. Courses are conducted in modern classroom/laboratories housed in the School of Engineering.

Many reports have explicitly outlined the value that technology and engineering (design-based fields) have on the educational quality in the K-12 system. These include, (i) *Rise Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future* (NAS and NAE, 2007), (ii) *Rise above the Gathering Storm, revisited: Rapidly approaching Category 5* (NAE and NRC, 2010), (iii) *Engineering in K-12 Education: Understanding the Status and Improving the Prospects* (NAE and NRC, 2009), (iv) *STEM Integration in K-12 Education, Status, Prospects, and an Agenda for Research* (NAE and NRC, 2014), and (v) the Next Generation Science Standards (NGSS), which require engineering content in science courses.

New Jersey also recognizes the importance of technology and engineering through the establishment of standards for K-12 students (NJ Core Content Standard 8.2 for "Technology Education, Engineering and Design"). Graduates of our programs receive certification to teach in New Jersey schools, and most states recognize teacher candidates from NCATE/CAEP accredited programs. Graduates from both the Technology/Pre-Engineering Education and i-STEM Education programs are in high demand.

### **Program Entrance, Retention and Exit Standards for the Technological Studies Programs**

#### (1) Technology/Pre-Engineering Education (Undergraduate-Secondary)

Retention in this program is based on the following performance standards in these "critical content courses": MAT127 (C-), PHY201 (C-), ETE131 (C), ETE271 (C), TED280 (C). A student who does not achieve these minimum performance standards and/or earns a grade of F in any other in-major course will be placed on the Engineering Programs Retention List. The State of New Jersey currently requires a cumulative GPA of at least 3.0 for students to be institutionally recommended for certification, and a department requirement is that students in this major must maintain a GPA of at least 2.60 for any single academic

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semester. Students who do not achieve this minimum “single semester” GPA milestone will be placed on the Engineering Programs Retention List. Placement on the Retention List for two consecutive semesters or any three non-consecutive semesters will result in dismissal from the major. Students dismissed from the major may appeal for re-entry into the major. It is possible for a student to re-enter the major as a “non-certification” student as long as (i) the student has a cumulative GPA above 2.0 and (ii) the student has written approval from the Department Chair and Dean of the School. Students dismissed from the major may not enroll in School of Engineering offerings with the exception of offerings that meet Liberal Learning program requirements.

Entrance (internal transfer) into this program from another program within the College is based upon the following performance standards in these “foundation courses”: MAT127 (C-), PHY201 (C-). Internal transfer within engineering programs will be permitted as long as enrollment limits are not exceeded.

### (2) Integrative-STEM Education (Undergraduate-Primary)

Retention in this program is based on the following performance standards in these “critical content courses”: MAT127 (C-), ETE271 (C). A student who does not achieve these minimum performance standards and/or earns a grade of F in any other in-major course will be placed on the Engineering Programs Retention List. In-major courses for this major are any professional (education/methods) or content (STEM) course required for the integrative-STEM Education major, including Specialization courses. The State of New Jersey currently requires a cumulative GPA of at least 3.0 for students to be institutionally recommended for certification and licensure. The department requirement is that students in this major must maintain a GPA of at least 2.60 for any single academic semester. Students who do not achieve this minimum “single semester” GPA milestone will be placed on the Engineering Programs Retention List. Placement on the Retention 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.

Entrance (internal transfer) into this program from another program within the College is based upon the following performance standards in these “foundation courses”: MAT127 (C-), TST161 (B-), ETE261 (B-) and MAT105 (C). Internal transfer within engineering programs will be permitted as long as enrollment limits are not exceeded.

## Program Course Sequences

### (1) Technology/Pre-Engineering Education (Undergraduate-Secondary)

Candidates for a teacher-education certificate must have a cumulative grade point average of at least 3.0 to successfully complete this education program. They also must meet the state hygiene/physiology requirement; the state Harassment, Intimidation, and Bullying Prevention (HIB) training certificate requirement, and pass the appropriate PRAXIS examination(s) 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”. 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.

### **Required Major Courses (Content)**

TST 161/Creative Design  
MAT 127/Calculus A

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PHY 201/General Physics I  
ETE 111/Engineering Design  
ETE 131/Engineering Math (counts toward NJDOE Middle School Math Endorsement)  
ETE 261/Multimedia Design  
ETE 271/Structures and Mechanics  
ETE 275/Mechanics and Materials  
ETE 281/Analog Circuits and Devices  
ETE 341/Environmental and Biotechnology Systems  
ETE 361/Architectural and Civil Engineering Design  
ETE 365/Prototyping Lab (0.5 unit)  
ETE 371/Mechanical Systems Design  
ETE 381/Digital Electronics  
ETE 385/Controls & Robotics (0.5 unit)  
ETE 395/Sr. Design Proposal (0.5 unit)  
ETE 461/Manufacturing Systems,  
ETE 492/Facilities Design and Management  
ETE 495/Sr. Design Proposal

### Required Major Courses (Professional)

TED 280/Introduction to Teaching Technology & Engineering Education  
TED 380/Junior Professional Experience  
TED 460/Integrated STEM for the Child/Adolescent Learner  
TED 480/481/490 Content & Methods/ Seminar/ Student Teaching

### Required Education Courses

SPE 203 Psych. Child./ Adole. Development  
SPE 323 Inclusion/ Disabilities

### Suggested Course Sequence Technology/Pre-Engineering Education

#### First Year (by advisement)

FSP	First Seminar	1 course unit
MAT	127/Calculus A	1 course unit
TST	161/Creative Design	1 course unit
ETE	261/Multimedia Design	1 course unit
PHY	201/General Physics I	1 course unit
ETE	111/Engineering Design	1 course unit
ETE	131/Engineering Math	1 course unit
WRI	102/Academic Writing (if not exempt)*	1 course unit

#### Total for year

**8 course units**

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

### Technology Minor

The minor consists of five units:

Required: TST 161/Creative Design

And select four of the following courses (with at least one 300-level course):

ETE 111/Engineering Design

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ETE 131/Engineering Math (counts toward NJDOE Middle School Math Endorsement)  
ETE 261/Multimedia Design  
ETE 271/Structures and Mechanics  
ETE 275/Mechanics & Materials  
ETE 281/Analog Circuits and Devices  
ETE 341/Environmental and Biotechnology Systems  
ETE 361/Architectural and Civil Engineering Design  
ETE 381/Digital Electronics  
ETE 461/Manufacturing Systems

### (2) Integrative-STEM Education (Undergraduate-Primary)

This disciplinary (second) major is open to all K-6 education majors [(i) Elementary Education (ii) Early Childhood, (iii) Special Education, (iv) Deaf and Hard of Hearing and (v) Urban Education]

#### **Required Major Courses (Content)**

TST 161/Creative Design  
MAT 127/Calculus A  
ETE 261/Multimedia Design  
ETE 271/Structures and Mechanics  
TED 460/Integrated STEM for the Child/Adolescent Learner

Note 1: i-STEM Ed. students are required to choose an area of (STEM) Specialization.

Note 2: There are other required courses in i-STEM Education but depend on which Specialization a student chooses.

Note 3: There are 5 choices for a Specialization: (i) Technology/pre-engineering education, (ii) Mathematics, (iii) Biology, (iv) Chemistry and (v) Physics.

Note 4: Three education endorsements are possible with the i-STEM major, and often completed; (i) Middle school mathematics, (ii) Middle school science and (iii) Secondary technology/pre-engineering education.

#### **Suggested Course Sequence integrative STEM Education Freshman Year (by advisement)**

FSP First Seminar  
MAT 127/Calculus A  
TST 161/Creative Design  
ETE 261/Multimedia Design  
Science Option #1 (by advisement)  
MAT 105/Mathematical Structures & Algorithms for Education I  
(or MAT 106/Mathematical Structures & Algorithms for Education II)  
WRI 102/Academic Writing (if not exempt)\*

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