

School of Engineering

A focus on Integrative STEM education has been building nationally, with recent emphasis on “design pedagogy,” which utilizes the Technology and Engineering components of STEM to engage students in a highly integrative, interdisciplinary fashion with deeply authentic teaching and learning experiences. Recently, the Next Generation Science Standards (NGSS) recognized the value of the T&E of STEM and explicitly included engineering design into both their framework and detailed standards for PK–12 education. The School of Engineering at TCNJ has substantial experiences and expertise in K–12 Technology and Engineering education, as well as Integrative STEM education. The School of Engineering’s Department of Integrative STEM Education has had strong STEM-oriented education programs since approximately 1987, when a strong shift towards design pedagogy occurred in the department’s teacher preparation curriculum. The Department of Integrative STEM Education started the country’s first Integrative STEM teacher preparation program in 1998: the PK–6(8) iSTEM program (originally named “Math/ Science/ Technology”). For the past several years, the iSTEM undergraduate program has been the largest disciplinary content area for teacher education candidates at TCNJ. Additionally, TCNJ has been strongly involved nationally, serving on important national committees on PK–12 Technology and Engineering Education, and has led the development of STEM teaching methods and has published substantially in the field.

Master of Education (M.Ed.) in Integrative STEM Education STEM_MED01

The Department of Integrative STEM Education.

Coordinator: Dr. Manuel Figueroa, figueroa@tcnj.edu

Program code: STEM_MED01, Integrative STEM

This program is designed for in-service, certified teachers. The program offers an intellectually stimulating course of study that provides in-service teachers with integrative, design-centric teaching and learning methods applicable across PK–12 grade levels. Key components of the Integrative STEM M.Ed. program include:

- 1) Integrative: Substantial emphasis on Integrative (cross-curricular) methods, between STEM components but also, and as importantly, includes valuable connections with non-STEM content areas.
- 2) Design Pedagogies: Design pedagogies can be described as design-centric Problem/Project Based Learning (PBL) methods and are covered extensively within the program. Design processes (the “T&E” of STEM) require higher levels of cognitive thinking, and importantly, often include highly contextualized frameworks.
- 3) Content Area Knowledge: Content in individual STEM areas is covered throughout the program within both Methods and Content courses, yielding valuable content/context specific applicability. Additional NJ State content endorsements may be possible depending on individual’s backgrounds.
- 4) Practical Approach: Gives teachers practical skills & knowledge, including curricular writing, inclusive practices, and deep connections to educational standards (Next Generation Science Standards, Common Core, 21st Century skills, etc.). TCNJ college certificates or NJ State certification paths are possible.

Admission Requirements:

Bachelors degree with a valid teacher certification.

Graduate Record Exam (GRE)—For test waiver information, please visit <http://graduate.tcnj.edu/apply/>.

Submission of Graduate Application materials, including a Field Supplement Report. (See Graduate Studies website for more detailed descriptions of required application materials for matriculation and non-matriculation students.)

Graduation Requirements:

Cumulative grade point average of 3.0 in the M.Ed. in Integrative STEM program, completion of all program requirements/prerequisites.

Required Courses:

I. Teaching & Learning Core 15 cr.

- STEM 510: Foundations in Integrative STEM
- STEM 520: Integrative STEM Pedagogy
- STEM 530: Integrative STEM Curriculum
- STEM 610: Emerging Trends & Issues in Integrative STEM Education
- STEM 660: Creativity & Systems/Critical Thinking in Education
- STEM 700: Integrative STEM Education Capstone

II. STEM Education Content & Research 9 cr.

- STEM 631: Math & Statistics for Integrative STEM Education
- EDFN 508: Introduction to Education Research
- Any STEM Education elective course (see Design pathway below for options)

III. STEM Education Electives 12 cr.

Complete the four courses outlined in any of the following pathways

(A) Supervisor certification

- SUPV 520: Supervisor & Instructor Leadership
- CURR 514: Curriculum: Theory & Practice
- EDAD 617: Advanced School Leadership: Supervision/ Administration
- CURR 555: Advanced Curriculum

(B) Design

Pick any four courses not already taken from the following:

- STEM 635: Data Visualization & Analytical Information Design
- STEM 641: Biotechnology Systems and Sustainable Design for Educators
- STEM 661: Architecture & Civil Technology Systems & Design for Educators
- STEM 671: Mechanical Technology Systems and Design for Educators
- STEM 681: Electronics Technology Systems and Design for Educators

(C) Research

- STEM 680: STEM Education Research
- STEM 710: Thesis
- Any two STEM content courses (listed in the Design pathway)

(D) Inclusive Practice/Special Education (3 pathways)

a. Inclusive Practice: English Language Learners

- ESLM 577
- ESLM 579
- ESLM 587

Choose one of: EDUC 513, EDUC 614, or EDUC 501

b. Inclusive Practice: Students with Disabilities

EDUC 513

EDUC 614

SPED 501

Choose one of: RDLG 579, SPED 624, or SPED 648

c. Inclusive Literacy Practices

RDLG 579 (prerequisite: a course in teaching reading, at undergraduate or graduate level)

RDLG 673

SPED 624

Choose one of: EDUC 513, EDUC 614, or SPED 624

(E) Middle School Math:

Pick any four of the following:

MATH 591: Number Theory & Systems

MATH 594: Patterns, Functions, Algebra

MATH 595: Geometry

MATH 597: Discrete Math

MATH 598: Calculus

STEM 635: Data Visualization

(F) Environmental Sustainability Education:

ESED 501: Environmental Science for Teachers and Leaders

ESED 520: EcoJustice and Socioscientific Issues

ESED 600: Equity, Diversity, and Inclusion in Environmental Sustainability Education

STEM 641: Biotechnology Systems and Sustainable Design

(G) Self-Defined: Four courses approved by the Program Coordinator.

Integrative STEM Educational Methods Certificate

The Department of Integrative STEM Education. Coordinator:

Dr. Manuel Figueroa, figuerom@tcnj.edu

The Department of Integrative STEM Education offers a one-year graduate certificate (15 credits) in Integrative STEM Educational Methods. Students who complete the STEM core sequence (STEM 510, STEM 520, STEM 530, STEM 610), and the capstone course (STEM660/STEM700) are eligible for the certificate. The five courses can be completed in one calendar year starting every Spring Semester. Classes meet once a week in the evenings during the spring and fall semesters and twice a week during the summer semesters. Classes are taught in a blended format. Additionally, graduates who complete the Master of Education (M.Ed.) in Integrative STEM (36 credits) will automatically receive the TCNJ certificate in Integrative STEM Educational Methods.

Required Courses:

STEM 510: Foundations in Integrative STEM

STEM 520: Integrative STEM Pedagogy

STEM 530: Integrative STEM Curriculum

STEM 610: Emerging Trends & Issues in Integrative STEM Education

STEM 660: Creativity & Systems/Critical Thinking in Education

STEM 700: Integrative STEM Education Capstone