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, intradisciplinary 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. Matthew Cathell, cathell@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.