

GRADUATE CERTIFICATE IN STEM Education

OFFERED BY:

(Please list each department and program that will be offering the certificate. Each department/program that is listed here will be included as a selection for a student to apply for the graduate certificate within their department/program.)

Education

PARENT DEPARTMENT AND DEGREE:

(A primary department and program must be designated. (ex. Department of Electrical and Computer Engineering, Electrical Engineering, MS) This will be the department/program that is responsible for updating the graduate certificate as needed.)

Preliminary proposal for Education graduate degree has been submitted. Until that is approved, this is a standalone certificate without a parent degree.

INTENDED AUDIENCE: _x_Main Campus Students _x_Distance Students _Hybrid *(Check all that apply)*

PROGRAM DESCRIPTION:

Prepare to excel as a future faculty member or STEM educator with this certificate focused on evidence-based teaching practices for STEM disciplines. Graduate students will develop the skills to design inclusive, engaging, and effective learning experiences. Students will align assessments with learning outcomes, analyze data, and map curriculum. This program emphasizes taking educational research into practical application, preparing learners to confidently teach in universities, colleges, schools, or informal science education contexts. The certificate's curriculum is flexible, allowing students to select courses that meet their career goals.

The program is designed for working professionals, practicing educators, and graduate students. Course assignments are designed using adult learning principles, so the knowledge and skills can be immediately applied in the learner's context.

PURPOSE:

Most STEM doctoral programs do not include coursework on effective teaching, although this is an important component of a faculty member's job. Educational research is constantly evolving as new technologies emerge. Even experienced high school teachers may desire updated knowledge on AI, STEM instruction, and research-based strategies.

CIP Code: 13.1213 — Science, Technology, Engineering, and Mathematics (STEM) Educational Methods

ADMISSION:

The STEM Education graduate certificate is open to all persons holding a bachelor’s degree or are currently accepted into a graduate degree program at Missouri S&T. Once admitted to the program, the student must take the four designated courses (provided in the curriculum section). In order to receive a Graduate Certificate, the student must have an average cumulative grade point of 3.0 or better in the certificate courses. Once admitted to the program, a student will be given six years to complete the program.

Students admitted to the STEM Education Certificate Program will have non-degree graduate status, however, they will earn graduate credit for the course they complete.

GATEWAY FOR ADMISSION TO MASTER’S DEGREE

N/A

CONTRIBUTING FACULTY:

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STUDENT ENROLLMENT

(Estimate the total number of students that will enroll in the program during its first five years. Please provide the justification for these numbers (if any).)

Table 1. Student Headcount Projections, Years 1-5

Year	1	2	3	4	5
Full time					
Part time	5	10	15	20	25
Total	5	10	15	20	25

This program is designed to be part time (one course per semester), as a complement to a PhD student’s research or coursework. K-12 teachers will probably only enroll part time. This certificate is designed as part of the stackable certificate master’s program. It is anticipated once that is approved, there will be more interest in the certificate if it feeds into a graduate degree.

PROGRAM LEARNING OUTCOMES (PLOs)

(Please include measurable statements that describe the knowledge, skills, and abilities students are expected to achieve upon completing the graduate certificate)

By the end of this certificate program, participants will be able to:

- Create appropriate course/module learning outcomes mapped to program learning outcomes,
- Select and use effective formative and summative assessment techniques to document improvement of instruction.
- Implement evidence-based instructional strategies to improve student learning outcomes in STEM disciplines.
- Apply research-based student support practices to foster inclusive learning environments in STEM
- Design, align, and evaluate STEM curricula for specified levels, using national standards as a guide.
- Communicate research and advocate effectively about STEM educational issues in a wide range of instructional and professional contexts.

CURRICULUM:

(Please also list co-listed courses if they can also be used for the graduate certificate)

Choose One (Engineering course required for Engineering PhD students)			
Course Number <i>(i.e. Elec Eng 5510)</i>	Course Title <i>(i.e. Electric-Drive Vehicles)</i>	Credit Hours <i>(i.e. Lec 3.0)</i>	New or Existing
EDUC 5060	Advanced STEM Teaching Methods	Lec 3.0	New
ENV ENG 5070	Teaching Engineering	Lec 3.0	Existing, co-listed with other engineering depts
Choose three from the following (if not taken above):			
EDUC 5060	<i>Advanced STEM Teaching Methods</i>	<i>Lec 3.0</i>	<i>New</i>
EDUC 5225	<i>Curriculum Development and Assessment</i>	<i>Lec 3.0</i>	<i>Existing</i>
EDUC 5370	<i>Effective Instructional Strategies</i>	<i>Lec 3.0</i>	<i>Existing, will be crosslisted with undergrad course</i>
EDUC 5070	<i>AI and Computer Science for Educators</i>	<i>Lec 3.0</i>	<i>New, DESE funding available for teachers if course is approved</i>
TCH COM 5550	<i>Advanced Proposal Writing</i>	<i>Lec 3.0</i>	<i>Existing</i>

COURSE DESCRIPTIONS:

(Please include the delivery method and prerequisites for each course, as well as how often the course will be offered (i.e. every fall, spring, summer))

EDUC 5370 Effective Instructional Strategies (LEC 3.0)

Participants will develop an understanding of research-based instruction and the ability to implement the instructional strategies in their classrooms. In addition to effective instructional practices, the course will focus on leadership, empowerment, and collaboration. Prerequisite: Graduate standing. Not currently listed but in catalog (description revised SP 26)

ENV ENG 5070 Teaching Engineering

Introduction to teaching objectives and techniques. Topics include: using course objectives to design a course; communication using traditional and cutting-edge media; textbook selection; assessment of student learning; grading; student learning styles; cooperative/active learning; and student discipline. Prerequisite: Graduate standing. (Co-listed with Eng Mgt 5070, Comp Eng 5070, Elec Eng 5070, Civ Eng 5070).

Not currently offered but in catalog.

Delivery Method: asynchronous online, offered every fall and as needed in summer

EDUC 5060 Advanced STEM Teaching Methods

Learners will understand how students and adults learn science, technology, engineering, and mathematics (STEM) through the investigation of active learning strategies. Integration of STEM disciplines through strategies to situate students in their learning context such as project- and problem-based learning, technology usage, and engineering design. Learners will consider implementation of STEM teaching methods, in addition to establishing connections between theoretical foundations of STEM learning with classroom applications. Prerequisite: graduate standing

New course, not yet created or offered.

EDUC 5070 AI and Computer Science for Educators

This course blends core computer science and related mathematical concepts with proven instructional strategies to equip K-12 teachers for classroom computer science instruction and ethical AI use. Concepts applied to the classroom include computational thinking, algorithms, data structures, coding, project-based instructional models, standards-aligned lesson design, hardware, and lab implementation. Appropriate AI use for teachers and students will be a focus.

New course, not yet offered or created. Funding available for K-12 teachers if course meets criteria listed here: <https://dese.mo.gov/media/pdf/computer-science-approved-trainings-and-courses>

EDUC 5225 Curriculum Development and Assessment (LEC 3.0)

Curriculum will be analyzed using research-based processes. Teacher leaders will model collaborative and reflective practice based on student data and practice leading teams to do the same. Instructional strategies and assessments that address issues of diversity and equity will be the focus.

TCH COM 5550 Advanced Proposal Writing (LEC 3.0)

Familiarizes graduate students with many aspects of writing proposals for various purposes in academic, professional, and public spheres. Offers opportunities to write documents to promote their academic, professional, or personal goals or those of their organization(s). Credit will not be given for both TCH COM 4550 and TCH COM 5550. Prerequisites: Graduate standing.

A cover letter signed by the respective college dean must be included with the proposal.
If you have any questions about this form