CERTIFICATE STUDENT HANDBOOK 2021-2022

ENGINEERING AND SCIENCE EDUCATION

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INTRODUCTION

Welcome/Purpose of this Handbook

Welcome to the Department of Engineering and Science Education (ESED) at Clemson University. We wish you success at every stage of your academic journey.

This handbook is intended to familiarize you, as an ESED Certificate student, with the requirements, policies and procedures involved throughout your Certificate experience. The rules and regulations provided in this handbook govern our academic programs and describe the coursework required to complete the Certificate. This handbook was approved by the faculty of ESED. Each student should be familiar with the contents of this handbook and that of the Graduate School. These rules and requirements are in addition to and subordinate to those described in the *Graduate School Policy Handbook,* found at *https://www.clemson.edu/graduate/students/policies-procedures/index.html* or through the Graduate School office in E-108 Martin Hall. Any inconsistencies within this handbook or between this handbook and the *Graduate School Announcements* or *Graduate School Policy Handbook* should be brought to the attention of Dr. Karen High, Graduate Program Coordinator

Contact Information

Dr. Karen High serves as the primary advisor for Certificate students. Dr. High's office and email are Holtzendorff M15-D and khigh@clemson.edu respectively.

The Graduate Affairs Committee oversees the regulations and procedures of the program, coordinates curriculum updates and interacts with the Graduate School.

The Certificate Student Handbook is available at https://www.clemson.edu/cecas/departments/ese/.

Program Overview

The ESED Certificate program is a nationally unique graduate program in science, technology, engineering, and mathematics (STEM) education research. The Department of Engineering & Science Education, in the College of Engineering, Computing and Applied Sciences (CECAS) at Clemson University, is the only department in the country that includes engineering education, science education and mathematics education (also called discipline-based education research, or DBER) in a STEM college rather than a college of education. As such, it includes faculty who are experts in DBER, and who have active research programs in these areas. Students in this program will be exposed to the wide breadth of current and foundational STEM education research and will be prepared for education-related positions in their discipline.

The objectives of the ESED Certificate program are to prepare students and post docs, who are pursuing a PhD in a specific STEM discipline, for pedagogical and andragogical aspects of an academic career in STEM, positions in training and

education in STEM-based industries, or as educators in non-traditional settings such as museums, outreach centers, or non-profit organizations. Andragogy, adult learning, is a main focus of this certificate as we focus on post-secondary education and is a perfect fil to prepare STEM faculty for teaching and research. Certificate-holders will be prepared to become faculty in traditional STEM departments or academic staff through the combination of their education in their STEM discipline and the coursework of the ESED Certificate. They will be prepared to be scholarly teachers, action researchers, and agents of change in their workplaces.

ENTERING THE PROGRAM

Admission Requirements

The ESED Certificate program is designed for students who are content specialists in STEM disciplines and who seek to pursue education-related careers. Any PhD student at Clemson University who is in a STEM discipline is eligible for the ESED Certificate program. MS students in a STEM discipline may be considered on a case-by-case basis. Post-doctoral associates are also eligible but must apply and be accepted as non-degree students. Students must apply to the program through the graduate school website to receive the certificate. Students should reach out to Barbara Smith, ESED Student Services Coordinator (barbar2@clemson.edu) for any questions and to receive a code that will reduce the application fee. It is highly recommended that PhD students begin the Certificate program in their second or third year of their PhD studies to allow acclimation to their disciplinary department, advisor, and research topic.

Costs

For currently enrolled PhD students, there is no additional tuition and fees if the course credits do not exceed the maximum credit hours allowed. See https://www.clemson.edu/graduate/finance-tuition/index.html.

For post-doctoral associates and any full-time employee, up to six credit hours per semester can be taken as part of the fringe benefits of employment. To be eligible for the benefit, the employee must have full-time employment status with the university for 12 consecutive months prior to enrolling and be in good standing in relation to conduct and job performance.

COMPLETING THE PROGRAM

Requirements for the ESED Certificate

Students in the ESED Certificate program will be exposed to STEM education research, pedagogy, andragogy, professional preparation, and teaching/mentoring practice. The curriculum consists of eleven (11) credits. The recommended sequence is to take ESED 8000 (Seminar in Engineering, Science, and Mathematics Education) first. ESED 8720 (Action Research in Engineering, Science, and Mathematics Education) should be taken next. ESED 8610 (Practicum in Engineering, Science, and Mathematics Education) should be taken last. Students can fulfill the Pedagogy and Professional Preparation requirements by selecting among three course options.

Course sequence for Certificate		
ESED 8000 Seminar in Engineering, Science, and Mathematics Education		
ESED 8200 Teaching Undergraduate Engineering	ESED 8210 Teaching Undergraduate Science	ESED 8220 Teaching Undergraduate Mathematics
ESED 8720 Action Research in Engineering, Science, and Mathematics Education[1]		
ESED 8240 Teaching Postsecondary STEM Through E-Learning	ESED 8250 Student Strategies in Engineering, Science, and Mathematics Education[1]	ESED 8880 Preparing for the Professoriate
ESED 8610 Practicum in Engineering, Science & Mathematics[1]		

[1]Has pre- or co-requisites. (See catalog descriptions below.)

Engineering & Science Education Certificate Curriculum

Seminar

ESED 8000 | Seminar in Engineering, Science, and Mathematics Education (1 Credit)

Brings contemporary issues in engineering, science and mathematics education research into the classroom. Experts from academia, industry and the corporate world give presentations on various issues, including recruitment of minorities, retention issues, technology integration into engineering curricula, distance learning, engineering content into K-12

curriculum, learning theories and education policy issues. (Offered each fall and spring semesters.)

Pedagogy *(Choose one of the following courses)*

ESED 8200 | Teaching Undergraduate Engineering (3 Credits)

Designed for STEM graduate students seeking a career in academe. Includes both discussion and practice of effective teaching techniques, assessments and technologies, an overview of current engineering education research, and equity and inclusion in the undergraduate engineering classroom.
(Offered fall semester.)

ESED 8210 | Teaching Undergraduate Science (3 Credits)

Designed for STEM graduate students seeking a career in academe. Includes both discussion and practice of effective teaching techniques, assessments and technologies, an overview of current science education research, and equity and inclusion in the undergraduate science classroom. (Offered spring semester and summer session.)

ESED 8220 | Teaching Undergraduate Mathematics (3 Credits)

Designed for STEM graduate students seeking a career in academia. Includes both discussion and practice of translating modern mathematics education research to instructional practice. Topics include effective teaching techniques, assessment issues, the role of technology in mathematics instruction, and equity and inclusion in the undergraduate mathematics classroom. (Offering TBA)

Research Methods

ESED 8720 | Action Research Engineering, Science, and Mathematics (3 Credits)

This course provides an overview of action research with qualitative/quantitative/mixed methodologies. Students produce a written action research proposal demonstrating competencies in research methodologies. This course does not satisfy the Research Methods requirement for the PhD in

Engineering and Science Education. Pre- or co-requisite of ESED 8200 or ESED 8210. (Offered each fall and spring semester.)

Professional Preparation *(Choose one of the following courses)*:

ESED 8240 |Teaching Postsecondary STEM Through E-Learning (3 Credits)

This course is designed to better equip professors and graduate students to teach STEM classes online while fostering an inclusive environment. Participants will implement course redesign, explore best online teaching practices, and collaborate for peer editing. (Offered spring semester)

ESED 8250 | Student Strategies in Engineering, Science, and Mathematics Education (3 Credits)

This course explores strategies students employ when working through problems or projects in science, engineering and mathematics. Content includes underlying theories of student strategies such as self-regulation, epistemic cognition and motivation; characteristics of problems; and instructional approaches to facilitate effective student problem-solving strategies. Pre- or co-requisite ESED 8200 or ESED 8210. (offered spring semester)

ESED 8880 | Preparing for the Professoriate (3 Credits)

Prepares students for obtaining a faculty position and achieving tenure in science, mathematics and engineering disciplines. Students develop a professional portfolio, prepare for the application/interview process and write a mini-proposal. Students should take this class when they are one to two years away from graduation. Preq: Enrollment in a doctorate program in the College of Engineering, Computing and Applied Science or the College of Science or the College of Agriculture, Forestry, and Life Sciences. (Offered each fall and spring semester).

Practicum

ESED 8610 Practicum in Engineering, Science, and Mathematics Education (1 credit)

Practicum that includes teaching or mentoring undergraduates in Engineering, Science or Mathematics (General Engineering or student's home department). Counts towards a Certificate in Engineering and Science Education. May be

repeated for a maximum of three credits. Preq: ESED 8710 or 8720. (Offered each fall and spring semester).

Note: The goal of ESED 8610 is to provide a means to reflect, engage others, and critically examine the role of teacher and mentor in the learning process. Each student should be engaged in a concurrent teaching or mentoring experience that equates to roughly 25-30 hours of contact time with undergraduate students over the semester.

Course substitutions may be possible with approval by the Graduate Coordinator.

Advising

Prospective and current Certificate students may schedule an advising session with the Graduate Coordinator. The advising session will help with sequencing the coursework, providing information about particular courses and jobs held by Certificate alumni, and answering any other questions or concerns.

Additional Opportunities

Departmental Seminars

All certificate students will be invited to ESED seminars that feature speakers. Students who do not wish to remain on the email list after completing ESED 8000 will be given the option to be removed from the list.

Lunch and Learn

The department holds “Lunch and Learn” every Friday. This is an opportunity for faculty and students to discuss current research papers. On days when the department is hosting a seminar speaker, this is an opportunity to interact in a less formal environment with our seminar guest. Certificate students are always welcome to attend, but it is not a requirement. Contact the Graduate Coordinator to get on this list.

FINISHING THE PROGRAM

Certificate Completion Requirements

Any students who have completed all the coursework requirements should contact the student services coordinator at ESEgradinquires@clemson.edu to indicate that all requirements have been completed. A form will be provided that ESED will submit to enrolled student services indicating that all requirements have been met. Enrolled Student Services will confirm by checking the transcript and issuing the Certificate to ESED at the close of the semester in which the courses were completed. ESED obtains the signatures necessary on the Certificate and delivers it to the student. The student does not have to be finishing the PhD requirements to receive the Certificate or to have the Certificate appear on the transcript.

A recognition ceremony and reception are held near the time of May graduation for all who have completed the Certificate. The actual Certificate will be available after the transcript has been through the enrolled student services process, which typically occurs after the graduation date for the semester in which the coursework has been completed. ESED will mail the Certificate to anyone who has graduated. Make sure that the ESED Student Services Coordinator has your correct mailing address.