

2024 Workshop on Nuclear-Environmental Engineering and Science Education

There is a growing need to produce the next generation of nuclear-environmental engineers and scientists to meet the needs of three important national missions including i) the need for expanded nuclear energy generation to fulfill the growing demand for clean and reliable energy and to align with our country's climate change goals through safer and more cost-effective technologies, ii) the need to safely address legacy nuclear facilities and wastes generated in past decades, and iii) the need to protect and safeguard our national security by preventing unchecked spread of nuclear technology or fissile material and the misuse of nuclear facilities and material. A cadre

of skilled engineers and scientists, particularly those that have the knowledge and experience working with nuclear technologies and environmental protection and cleanup methods, is essential to support these vital missions. However, U.S. government agencies and private industry have been communicating for the past 20+ years that the U.S. nuclear-environmental workforce is aging and there is not an adequate pipeline of educated and trained personnel. Therefore, for these reasons, it is imperative that academic institutions grow existing educational programs or launch new ones that are focused on the nuclear-environmental field of study and are designed to meet the needs of governmental and industrial partners.

What is Nuclear-Environmental Engineering and Science?

This term encompasses the field of study that includes a combination of nuclear and environmental engineering and related science disciplines. It includes expertise in areas such as the nuclear fuel cycle, radioactive waste management, radiochemistry, health physics, environmental risk assessment, environmental remediation, regulatory compliance, project management, and technical communications.

In July 2022, a workshop was held at the Massachusetts Institute of Technology (MIT) with the goal of improving nuclear waste education. The participants included university professors, industry experts, and government officials that work in the nuclear-environmental industry. Strategies were discussed on how to develop the next generation workforce through innovative teaching approaches and how to teach the key concepts to broader engineering and scientific communities. The workshop identified the need to (i) develop community resources for nuclear waste education; (ii) synthesize historical perspectives, including past contamination and nuclear and hazardous waste management; (iii) provide the life-cycle perspective and identify proper waste management as a key component for energy sustainability; and (iv) teach students about classical and innovative ways to communicate technical information, including risk, to various audiences and stakeholders.

A second workshop was held the following summer at Clemson University with the goal of making progress on developing teaching resources that can be used by universities with nuclear-environmental engineering and science curriculums. Various nuclear topics were discussed by private and government representatives to give participants a sense of educational needs. Existing educational programs were reviewed to create recommendations to increase a student's exposure and experience in this important industry. Additionally, community resource needs were identified.

The third Educators Workshop will be held from July 30 – August 1, 2024, at Vanderbilt University and will build on the progress made in the first two workshops. The focus will be on identifying the competencies needed to ensure that engineering and science students have the required knowledge and skills to join the nuclear-environmental workforce. This will include the development of a curriculum guide and educational material with a focus on students seeking a graduate education program (e.g., a master’s degree in nuclear-environmental engineering or science) which can address the problems facing the nuclear-environmental industry. Supplemental courses for an undergraduate minor that would integrate with other engineering and related science disciplines will also be included. A draft curriculum guide will be developed prior to the meeting and discussions at the workshop will focus on (i) the topical areas and subjects included in the guide, (ii) available resources for educators, and (iii) opportunities for future collaboration among students, researchers, and professionals focusing on the types of facilities and research equipment required for this field of study and its availability at existing institutions.