Nuclear Engineering Program Facilities

- Dedicated Compute Cluster (operated by VT3G)
- Dedicated Server for VRS-RAPID
- Advanced Research Computing
- Visionarium (pictured)
- Center for Neutrino Physics - CHANDLER Project
- Molten Salt Chemistry Loop
- Two-Phase Visualization and Measurement Loop
- High-Temperature Water Loops
- Access to the US Naval Academy
- Nuclear Materials & Fuel Cycle Laboratory
- Advanced Nuclear Coolant Corrosion and Chemistry
When the Nuclear Engineering program was re-instituted at Virginia Tech in 2007 it was on the heels of the nuclear industry's need for trained personnel, and the country's need for vigorous research into areas such as nuclear safety, non-proliferation, and the need to improve our nation's nuclear infrastructure. As a land grant university, Virginia Tech has strived to meet the growing and changing needs of the nation in a variety of areas such as engineering, science, and agriculture, to name a few.

Today, Virginia Tech's Nuclear Engineering program is a leader in the field and boasts world-class laboratories at Virginia Tech's main campus in Blacksburg as well as in the National Capitol Region. Our laboratory and experimental capabilities are complemented with partnerships with a number of national labs. In addition, the program is part of a collaborative effort with universities, government agencies, national laboratories, and industry, to meet the challenges of climate change - challenges which cannot succeed without the safe, effective and peaceful use of our nation's nuclear power facilities. Our renowned faculty and their students are conducting some of the most exciting and impactful research in nuclear engineering.

The growing importance of nuclear energy, safety, and non-proliferation, can be seen in the great interest in our program, which has in only four years, begun producing masters and doctoral-degree holders who will help lead our nuclear policy into the future. In addition to nuclear engineering students, highly qualified students from diverse backgrounds in engineering, physics, and sciences with sufficient preparation can join our graduate program in Nuclear Engineering within the Department of Mechanical Engineering.

Please browse through this brochure for an overview of our program. I invite you to join us at VT in this exciting journey to invent and shape the future of nuclear engineering and sciences with some of the best faculty and expertise in the field.
Collaborations

Nuclear Education Hub
- George Washington University

Benchmarking of RAPID code system
- The Jozef Stefan Institute, Slovenia, TRIGA Research Reactor

Multiphysics for Advanced Reactor Simulation (MARS) Center
- Georgia Tech
- Pennsylvania State University
- North Carolina State University
- Jozef Stefan Institute
- Dept. of Mechanical Engineering
- Dept. of Materials Science Engineering
- Dept. of Physics

Center for Neutrino Physics-Optimization of the antineutrino CHANDLER detection
- Advanced Materials Research
- Idaho National Laboratory
- Los Alamos National Laboratory
- Oak Ridge National Laboratory
- University of Wisconsin
- Massachusetts Institute of Technology
- University of Utah

Nuclear Fuel Cycle Research
- Idaho National Laboratory
- Georgia Tech
- Oregon State University
- Rensselaer Polytechnic Institute
- Massachusetts Institute of Technology
- Ohio State University
- Argonne National Laboratory
- Oak Ridge National Laboratory

Nuclear Policy Education
- VT School of Public and Intl. Affairs
- Dept. of Science, Technology & Society

Research and education collaboration and sharing facilities
- US Naval Academy

Virtual Reality Systems for nuclear fuel cycle
- VT Visionarium-Advanced Research Computing

Virginia Nuclear Energy Consortium
- Dominion
- EnFission
- Newport News Shipbuilding
- Virginia Commonwealth University
- Virginia Tech
A short history of nuclear engineering at Virginia Tech

The Nuclear Engineering Program was first established at Virginia Tech in 1956 as part of the Physics Department. The program, which moved to Mechanical Engineering, offered degrees until 1985.

In 2007, the decision was made to re-establish the program and approval was gained for VT to offer graduate degrees in nuclear engineering in 2014.

In 2011, Professor Alireza Haghighat established the Nuclear Science and Engineering Lab in the National Capitol Region in Arlington, Virginia, operating under the auspices of the Institute for Critical Technology and Applied Science and the Mechanical Engineering department.

In 2017-2018 the program graduated one Ph.D. and five Master's students in Nuclear Engineering, and one Ph.D. with a Nuclear Engineering option. At any given time the program is home to around twenty students, most of whom are funded through fellowships, research assistantships, or teaching assistantships.

The program has received around $3 million in research and education awards from organizations including the Department of Energy, Nuclear Regulatory Commission, Air Force Office of Scientific Research, Bettis Atomic Power Lab, Babcock & Wilcox, Bechtel, Newport News Shipbuilding, and Sandia National Lab.

For Students

The nuclear engineering program has courses at both Blacksburg and in the National Capitol Region. Applicants interested in joining the Nuclear Engineering program will require:

- A minimum target grade point average of 3.2/4.0, or better for either the BS degree or in the last 60 hours of course work
- GRE target scores of:
  - 150, Verbal
  - 165, Quantitative
  - 4.5, Analytical
- Students who are not native English speakers must also take the internet-based TOEFL, IELTS, or have completed a degree from an English speaking institution.
- Minimum target scores:
  - 100 Total
  - 26 Reading and speaking areas
- Final admissions are made on a holistic evaluation of a candidate's application materials, research experience and three letters of recommendation, which are a significant part of the evaluation.
- The Nuclear Engineering program falls under the Department of Mechanical Engineering, and while the program processes applications on a rolling basis, students should be aware of the department's deadlines to be considered for admission and for assistantships/fellowships.
- Fall term deadline: Jan. 5
- Spring term deadline: Oct. 1

For more information, visit the program’s web page at: https://nuclear.ncr.vt.edu or contact Professor Alireza Haghighat, program director, Cathy Hill, graduate program coordinator, or Annette Ben-Tzvi, graduate academic advisor.
Research Activities

The research activities of the Nuclear Engineering Program address the applications of nuclear science and engineering to: Power, Security, Medicine, and Policy, with subject areas including:

- Nuclear materials and fuel cycle
- Reactor physics
- Radiation detection
- Thermal-hydraulics & reactor safety
- Particle transport methods
- Reactor shielding
- Advanced coolant chemistry, corrosion and control

Faculty research highlights include:
- Advanced transport methods
- Applications in reactor physics analysis and design
- Radiation shielding
- Nuclear security
- Medical imaging
- Nuclear safety
- Thermal-hydraulic systems
- Advanced light water reactors
- Two-phase flow modeling
- Advanced passive safety system design
- Non-proliferation and safe guards
- Nuclear power plant operations and safety
- Nuclear materials compatibility
- Nuclear fuel materials
- Nuclear fuel cycle technology
- ...and much more

Degrees Offered

- Doctor of Philosophy (Ph.D.)
- Master of Science (MS)
- Master of Engineering (MENG)
- Accelerated MENG for US Naval Academy
- Graduate Certificate (GC) in NE
- Graduate Certificate in Nuclear Science, Technology and Policy (NSTP)
Dr. Alireza Haghighat - Professor & Director  
PhD-Nuclear Engineering, University of Washington, 1986  
Chairman of the Board, Consortium (VNEC)  
https://nuclear.ncr.vt.edu/about/people/alireza-haghighat

Dr. Juliana Pacheco Duarte - Assistant Professor  
PhD-Nuclear Engineering and Engineering Physics,  
University of Wisconsin-Madison, 2018; 2014-2018 CAPES Science Without Borders Fellow;  
https://nuclear.ncr.vt.edu/about/people/duarte

Dr. Celine Hin - Associate Professor  
PhD-Materials Science, Institut Polytechnique de Grenoble and  
Commissariat a l’Energie Atomique  
https://nuclear.ncr.vt.edu/about/people/celine-hin

Dr. Yang Liu - Assistant Professor  
PhD-Nuclear Engineering, Purdue University, 2008.  
https://nuclear.ncr.vt.edu/about/people/yang-liu

Dr. Mark Pierson - Associate Professor of Practice  
https://nuclear.ncr.vt.edu/about/people/mark-pierson

Dr. Jinsuo Zhang - Professor  
https://nuclear.ncr.vt.edu/about/people/jinsuo-zhang

Dr. Tomonari Furukawa  
Professor, Mechanical Engineering  
PhD-University of Tokyo, 1996

Dr. Michael von Spakovsky  
Robert E. Hord Jr. Professor,  
Mechanical Engineering  
PhD-Georgia Institute of Technology, 1986

Dr. Ranga Pitchumani  
George R. Goodson Professor,  
Mechanical Engineering  
PhD-Carnegie-Mellon University, 1992

Dr. Danesh Tafti  
William S. Cross Professor,  
Mechanical Engineering  
PhD-Pennsylvania State University, 1989

Dr. Patrick Huber  
Professor, Physics  
PhD-Technische Universität München

Dr. Patrick Roberts  
Associate Professor, Public and International Affairs  
PhD-University of Virginia, 2006

Dr. Jonathan Link  
Professor, Physics  
PhD-University of California, Davis, 2001

Dr. Sonja Schmid  
Associate Professor, Science, Technology & Society  
PhD-Cornell University

Dr. Roop Mahajan  
Lewis A. Hester Chair,  
Mechanical Engineering  
PhD-Cornell University, 1977

Dr. Diana Farkas  
Professor, Materials & Science Engineering  
PhD-University of Delaware, 1980

Dr. Camillo Mariani  
Associate Professor, Physics  
PhD-University of Rome “La Sapienza”
Offering Ph.D., MS, and M.Eng.

Accelerated MS program for the U.S. Naval Academy

Graduate Certificate in Nuclear Engineering

Graduate Certificate in N. Sci., Technology & Policy