

NUCLEAR ENGINEERING PROGRAM

Contacts: haghighat@vt.edu / arjones@vt.edu

nuclear.ncr.vt.edu

CAMPUS:

Blacksburg & Northern Virginia
(Arlington)



2022-23 DEGREES

Doctoral: 3 / Master's: 3
Certificate: 1

FACULTY

5 Core / 12 Affiliate
2 Research

RESEARCH
EXPENDITURES:
\$2.03 MILLION

PROGRAM CENTERS/LABS/GROUPS

- Nuclear Materials and Fuel Cycle (NMFC) Center
- Multi-phase Flow and Thermal-Hydraulics (MFT) Laboratory
- Multiphysics for Advanced Reactor Simulation (MARS) Center
- Virginia Tech Transport Theory Group (VT³G)



ENROLLMENT

- 27 Graduate:
13 PhD, 14 masters
- 3 certificate
- 70 undergraduate minors
(from 15 majors)

AWARDS/ FUNDING

- 13 GRA
- 3 fellowship
- 3 GTA
- 4 scholarship

AFFILIATE ORGANIZATION AND FACILITIES

- Center for Nuclear Physics (CNP) (affiliate)
- Reactor Physics Division, Jozef Stefan Institute (JSI)
- TRIGA Mark II research reactor, JSI
- Virginia Innovative Nuclear (VIN) Hub nonprofit organization
- Virginia Nuclear Energy Consortium (VNEC) Nonprofit

UNIQUE EDUCATIONAL PROGRAM

- Established a graduate course on "experimental reactor physics" under a MOU signed with the Jozef Stefan Institute; the VT students spend 90 days at JSI, Slovenia and during this time, they conduct 11 experiments at the JSI's TRIGA reactor and become familiar with the operation of the TRIGA reactor.
- Accelerated Master of Engineering in Nuclear Engineering for the USNA midshipmen.
- Multidisciplinary graduate certificate on Nuclear Science, Technology and Policy among NE, STS and SPIA; attract students from engineering/science and policy related subjects to learn about technical and policy matters and tackle major issues facing nuclear technology.



MAJOR RESEARCH COLLABORATIONS

- Development of multi-modal (with CHANDLER antineutrino and neutron detectors) detection systems for monitoring reactor core (NE, Physics & CNP, NRC)
- Development of physics-informed machine learning (ML) algorithms using the RAPID code system and multimodal detection (NE, Physics & Industrial and System Eng. Programs, Jozef Stefan Institute (JSI) & Dominion Energy, NRC)
- Development of Mobile Antineutrino Demonstrator (NE, Physics, LANL, BNL, USNA, ORNL)
- Validation and verification of ML algorithms using the JSI's TRIGA research reactor (NE & JSI)
- Development of immersive visualization environment for nuclear reactor computational research and applications (NE & Visionarium)
- Advanced Materials Search – Molten Salt and liquid metal chemistry, corrosion, and control (INL, Gatech, Oregon State, RPI, MIT, ANL, ORNL)
- Study the full spectrum of two-phase flow regimes and conduct robust and accurate annular two-phase flow experiments and models for the safety analysis. (Bettis, ME, INL, NRC, Purdue)
- Design and analysis of novel microreactors for research, accelerator driven for Used Nuclear Fuel use, and autonomous operation. (JSI, OSU, UM, UU, LU, UVA, VCU), VT (NE, ME, ISE, Physics)

HIGHLIGHTS

- **Associate Professor of Practice Mark Pierson retired after 16 years at Virginia Tech.** Mark continues to be instrumental in bolstering the program by teaching courses.
- **Collegiate Associate Professor David Freeman was appointed in Nuclear Engineering.** He brings 22 years of experience at ORNL, including 14 as Safety Program Leader

at the Spallation Neutron Source.

- **Prof. Haghighat received the 2023 Gerard C. Pomraning Memorial Award** for "seminal contributions for development of high-fidelity deterministic, stochastic, and hybrid transport methods and their application to complex nuclear systems."
- **Prof. Haghighat named Robert E. Hord, Jr. Professor.**

- **Prof. Haghighat, delivers Nuclear Engineering Distinguished Technical Lecture,** "New Paradigm for Real-time, high-fidelity Particle Transport Simulation with Monte Carlo Accuracy," NCSU, Oct. 20, 2022.
- **Prof. Jinsuo Zhang was the recipient of College of Engineering Dean's Award for Excellence in Research.**