

UNIVERSITY DIRECTORY

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INTRODUCTION

The GAIN University Directory features a sample of universities engaged in the development of advanced nuclear technologies and should not be considered a comprehensive list of universities. All universities have participated on a voluntary basis and are responsible for the information provided. Inclusion of a university does not indicate endorsement by GAIN.

ACKNOWLEDGMENT

The GAIN University Directory was created by the Gateway for Accelerated Innovation in Nuclear (GAIN).



The mission of the GAIN initiative is to provide the nuclear energy industry with access to the technical, regulatory, and financial support necessary to move advanced nuclear technologies toward commercialization, while ensuring the continued reliable and economic operation of the existing nuclear reactor fleet. GAIN offers a single point of access to the broad range of capabilities across the Department of Energy (DOE) national laboratory complex. DOE has invested billions of dollars to build and maintain expertise and infrastructure within the national laboratory system. This vast capability is being leveraged via GAIN to support commercialization of new advanced nuclear technologies.

GAIN is operated through Idaho National Laboratory and works in partnership with Argonne National Laboratory and Oak Ridge National Laboratory.

If you have questions regarding the directory or other GAIN related activities please contact GAIN at GAIN@inl.gov.



@GAINnuclear



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UNIVERSITIES



Location: Rolla, MO

Website: <https://www.mst.edu/>

Department: Department of Nuclear Engineering

Department Website: <https://nuclear.mst.edu>

Point of Contact: Hyoung (Hank) Lee

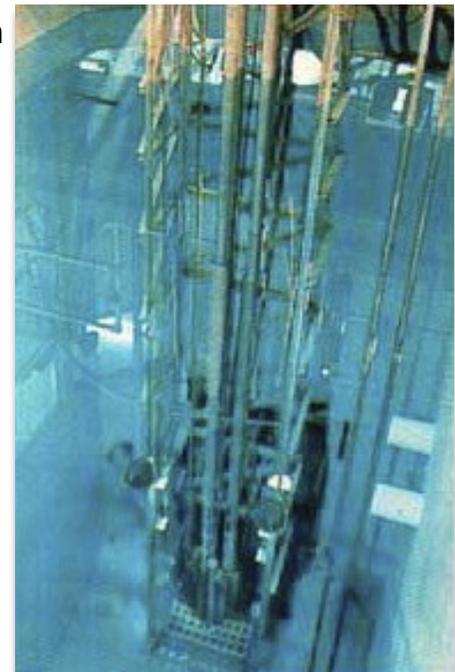
leehk@mst.edu

573-341-4747



We have nine dedicated full-time faculty with diverse research areas in nuclear engineering and related areas. We have received several research grants from U.S., Department of Energy, U.S. Department of Education, Nuclear Regulatory Commission, Army Research Lab, U.S. Defense Advanced Research Projects Agency, etc. The research areas include thermal-hydraulics, reactor physics, fuel cycle, small modular reactor design, nuclear waste disposal, nuclear materials, radiation detection and measurements, radiation shielding, nuclear forensics, radiochemistry, and radiation imaging.

We have a 200 kW nuclear reactor and a fusion of deuterium atoms (D+D) neutron generator as well as several research labs including radiation measurement and spectroscopy lab, nanotechnology, nuclear forensics and radiochemistry lab, two-phase and multi-phase flow lab, hydrogen and mass spectrometry lab, nuclear materials lab, radiation imaging lab, and high-performance computer lab.



NC STATE UNIVERSITY

Location: Raleigh, NC

Website: <https://www.ncsu.edu>

Department: Department of Nuclear Engineering

Department Website: www.ne.ncsu.edu

Point of Contact: Lisa Marshall

lisa.marshall@ncsu.edu

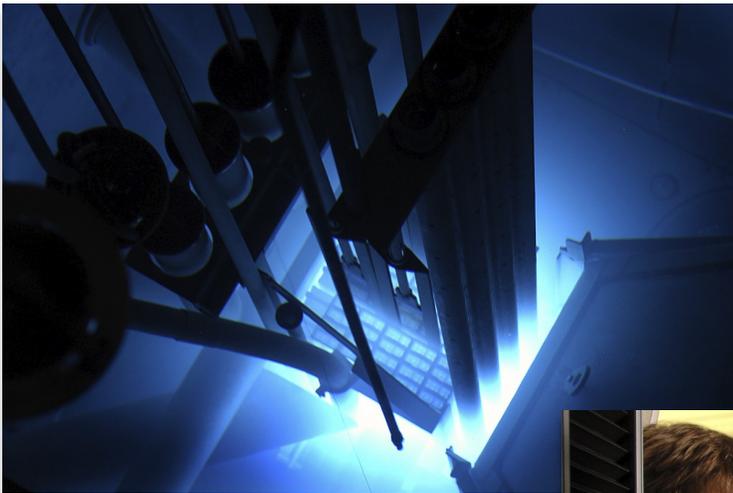
919-515-5876

Our faculty, professional staff as well as undergraduate and graduate nuclear engineering students are multidisciplinary in scope and possess skill sets in the follow research areas:

- Nuclear Power Design and Safety Analysis
- Radiation Science and Engineering
- Plasma Science and Engineering
- Nuclear Materials, Waste Forms and Storage
- Nuclear Security and Non-Proliferation
- Nuclear Computational Science



NC State University





THE OHIO STATE UNIVERSITY

Location: Columbus, OH

Website: <https://www.osu.edu>

Department: Nuclear Engineering Program,
Department of Mechanical and Aerospace Engineering

Department Website: <https://mae.osu.edu/nuclear>

Point of Contact: Joanne Holland

holland.129@osu.edu

614-292-3204

The Nuclear Science and Engineering application area covers research in a number of areas including the application of radiation, radioactive materials and nuclear fission in the areas of nuclear power, nuclear non-proliferation, radiation safety, and environmental management.



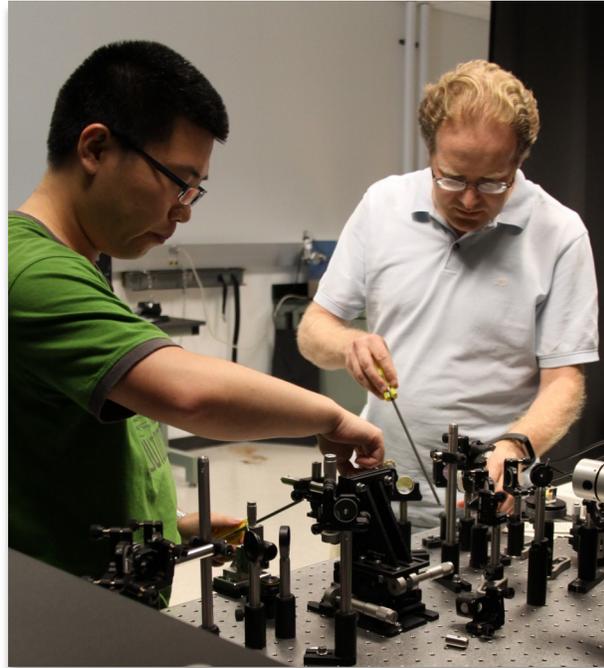
Research topics include: Risk, Reliability, and Safety Analysis (Aldemir, Smidts, Wang) includes nuclear reactor safety, probabilistic safety/risk assessment (PSA/PRA) of large engineering systems, non-linear system diagnostics and prognostics, reliability analysis, nuclear power plant severe accident analysis modeling, dynamic methods of PRA, uncertainty quantification in dynamic systems, and fire risk assessment.



Reliability and Risk Research @ Ohio State University
with GSE for the GPWR Full Scope Simulator

Applied Nuclear Physics and Radiation Science (Blue, Cao, Khafizov, Sinha, Vasques) is concerned with the interaction of different forms of ionizing radiation with materials and the modeling and simulation of radiation transport.

Applications include the development of novel sensors to detect radiation, nuclear reactor kinetics, advanced nuclear instrumentation and measurement methodology, the damage caused by radiation on material properties, use of neutrons, gamma- and X-rays as an interrogation or probing tool to study advanced materials or to characterize special nuclear materials, radiography, radiation therapy, and the mathematical modeling and numerical simulations of neutron and photon transport problems.



Nuclear Instrumentation and Control (Aldemir, Smidts, Sinha) covers instrumentation and control systems, software reliability modeling, automated software testing, human reliability analysis, digital systems reliability and risk assessment, advanced nuclear reactor instrumentation.

Nuclear Materials, Fuel Cycles, Waste Management Radiation Transport, Reactor Physics, and Thermal Hydraulics (Vasques and Wang) encompasses the mathematical modeling and computational methods development of radiation transport through matter, reactor physics, and reactor thermal hydraulics. Research includes the fields of neutron and photon transport, reactor core physics and kinetics, thermal hydraulics modeling and simulation, advanced reactors design, radiation shielding, nuclear security and non-proliferation, radiography, and radiation therapy, to name a few.

Labs and Centers:

- Reliability and Risk Laboratory
- Nuclear Computing Group
- Nuclear Reactor Laboratory
- Nuclear Analysis and Radiation Sensor Laboratory (NARS)



Oregon State
University

Location: Corvallis, OR

Website: <https://oregonstate.edu>

Department: School of Nuclear Science & Engineering

Department Website: www.ne.orst.edu

Point of Contact: Wade Marcum

wade.marcum@oregonstate.edu

541-737-3018



Oregon State University is uniquely positioned with infrastructure which is capable of supporting advanced reactor testing and experimental work. Oregon State

University has and utilizes numerous large-scale thermal hydraulic test facilities which support nuclear reactor license applications and technology qualification processes through the Department of Energy and Nuclear Regulatory Commission.





Location: Norwich, CT

Website: <https://www.threerivers.edu>

Department: Nuclear Engineering

Department Website: <https://www.threerivers.edu/academics/degrees-certificates/nuclear-engineering-technology>

Point of Contact: James Sherrard

jsherrard@trcc.commnet.edu

860-215-9472



This is the only program of its kind in New England, one of three in the country, and considered the best in the nation. Through classroom, laboratory, and simulator instruction, this program will educate you in the theories underlying the safe operation of nuclear power generating stations. Additional “hands-on” experience may be gained through 12 weeks of summer co-op employment at Millstone Station’s nuclear power plants. This program operates in cooperation with Millstone Station to prepare you as an entry-level technician primarily for the commercial nuclear power industry. This career path involves further training by the utility and successful completion of a license examination administered by the Nuclear Regulatory Commission. For many students, the Associate Degree in Nuclear Engineering Technology is but one step in their academic career as they move on to

pursue higher degrees upon graduating from Three Rivers.





University of Idaho
Idaho Falls

Location: Idaho Falls, ID

Website: <https://www.uidaho.edu/idaho-falls>

Department: Idaho Falls Center

Department Website: <https://www.uidaho.edu/enr/programs/nuclear>

Point of Contact: Alice Allen

alicew@uidaho.edu



The University of Idaho, Idaho Falls Center is uniquely positioned to offer outstanding research and educational opportunities to students. Located near the Idaho National Laboratory (INL) and home for the Center for Advanced Energy Studies (CAES), U of I Idaho Falls is a premier graduate, research and development center.

U of I Idaho Falls is currently addressing state and national energy needs in partnership with INL, and provides diverse research-based graduate science, engineering and technology programs with a limited number of undergraduate degree programs.

The school's ongoing vision is to be a nationally recognized institution of choice for students, faculty and researchers in the science and engineering fields; U of I Idaho Falls' strategic vision includes collaboration with a variety of institutions.

Partnerships include:

- The Idaho National Laboratory, which allows students access to INL resources, capabilities and expertise, and in turn, helps INL with advanced energy research, production, and safety. It also offers internships, postdoctoral research and exchanges.
- The Center for Advanced Energy Studies, a research and education consortium between Boise State University, INL, Idaho State University, U of I and the University of Wyoming. CAES provides students the opportunity to work with world-class scientists and engineers while pursuing their degrees.

The University of Idaho began offering classes in Idaho Falls in 1954, supporting the U.S. Department of Energy’s national laboratory activities. The program evolved to meet the educational needs of the INL and has since awarded more than 1,200 advanced degrees.

In partnering with INL, CAES and other state universities, U of I Idaho Falls delivers advanced education and research programs that promote excellence in scholarship and critical thinking to enhance today and prepare for tomorrow.



University of Idaho

NUCLEAR ENGINEERING & RELATED PROGRAMS 2018

nuclear@uidaho.edu



2017-18

- Students Enrolled in Courses – 80
- Students in Degree Programs – 56

College of **Engineering**

Nuclear Engineering – M.S., M.Engr., Ph.D.
Mechanical Engineering - M.S., M.Engr., Ph.D.
Chemical Engineering – M.S., M.Engr., Ph.D.
Computer Science – M.S., Ph.D.
Electrical Engineering – M.S., Ph.D.
Materials Science & Engr. – M.S., Ph.D.
Nuclear Criticality Safety certificate
Critical Infrastructure Resilience certificate

Research Assistantships

Employer Education Benefits

NRC Fellowships

Teaching Assistantships

Internships

INL Fellowship

Other Funding

Self Funded

Scholarship for Service

Faculty & Research Areas

Rich Christensen – Director – design, fabrication & testing of heat exchangers for advanced reactors, single & two phase flow, heat transfer

Dave Arcilesi – thermal hydraulics, heat transfer, scaling analyses, experiments

Bob Borrelli – safeguards-by-design, fuel cycle analysis, modeling, scientific computing, risk assessment, nuclear hybrid energy system design, fuel cask design & analysis, nuclear system data analytics

Indrajit Charit – nuclear materials, radiation effects, high temperature materials, microstructure-properties correlations

Samrat Choudhury - structural nuclear materials, nuclear fuels, machine learning, multi-scale modeling of materials

Michael Haney – human-cyber-physical systems (industrial control protocols, digital instrumentation & control), cybersecurity for nuclear, power & water systems, computer & network security, digital forensics, active defenses, critical infrastructure resilience

Bob Hiromoto – parallel algorithms, communication protocols for UAV’s, secure wireless networks

Mike McKellar - nuclear hybrid energy, heat exchangers, process modeling

Lee Ostrom – Associate Dean College of Engineering - risk assessment, nuclear safety, project management, industrial ergonomics

You Qiang – nanomaterials & nanotechnology for nuclear energy magnetics separation for spent nuclear fuel recycling, neutron radiation detection & instrumentation, radiation shielding

Krishnan Raja – degradation of nuclear structural materials, non-destructive materials evaluation & electrochemistry of molten salt reprocessing

Dakota Roberson – renewable energy integration, power system control, estimation & detection

John Russell – energy policy, cybersecurity, big data & analytics

Bob Smith – nuclear waste management, subsurface science

Vivek Utgikar – hydrogen and energy systems, advanced fuel cycles, energy storage

Haiyan Zhao – molten salt reactors, TRISO fuels for advanced gas reactors, nuclear waste reprocessing & recycling, advanced characterization, catalysis in petroleum, biofuels, natural gas

AFFILIATED RESEARCH FACILITIES
Center for Advanced Energy Studies
caesenergy.org

Idaho National Laboratory
inl.gov

Center for Space Nuclear Research
csnr.usra.edu

A few highlights:

- 1954 - UI 1st Education Contract with INL (then NRTS). Has been renewed each year thereafter.
- 2005 – DOE designates INL as lead nuclear national lab.
- 2009 – CAES building opened, UI is a leader in the growth and development of the CAES collaborative programs.
- 2014 – UI received NRC faculty development grant
- 2016 – UI awarded NRC Fellowships to support 2 masters students per year
- 2016 – Standard core of courses implemented.

Contact Information
Dr. Rich Christensen, Director, 208-533-8102, rchristensen@uidaho.edu
uidaho.edu/idaho-falls



Location: Urbana, Illinois

Website: <https://illinois.edu>

Department: The Grainger College of Engineering
Department of Nuclear, Plasma, and Radiological
Engineering

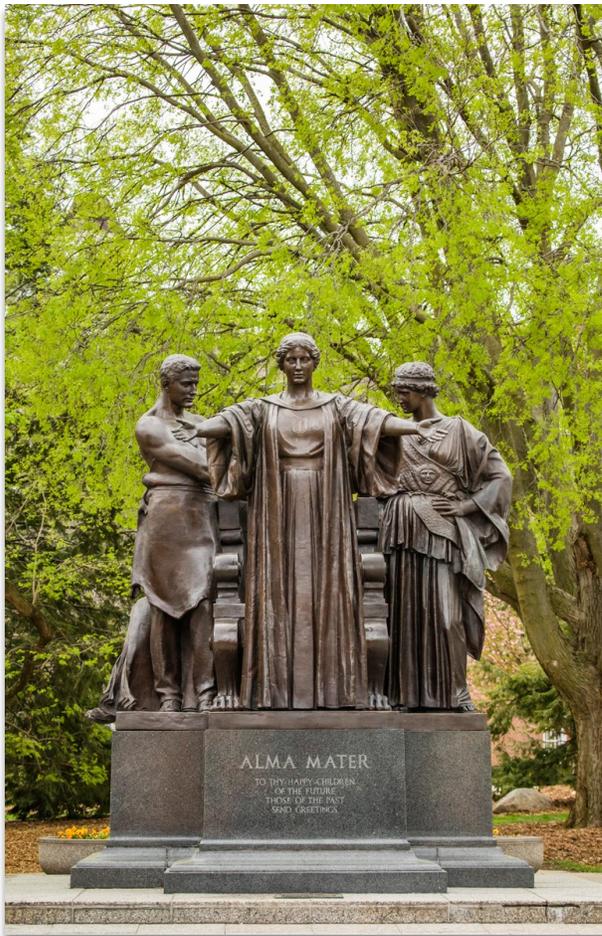
Department Website: <http://npre.illinois.edu>

Point of Contact: Susan Mumm

s-mumm@illinois.edu

217-244-5382

Nuclear, Plasma, and Radiological Engineering at the University of Illinois focuses research in these areas: materials, nuclear power, plasma physics and fusion, radiological science, and reliability and risk.



Materials research includes mechanical properties of cladding and other structural components, and heat exchanger materials. Advanced microanalytical analysis techniques are employed to perform nano-scale interrogation of deformation, precipitation, and chemical segregation studies. Ion beam bombardment of materials runs concurrent with these techniques to simulate fast neutron displacement cascade damage. Fuel performance modeling, molecular dynamics, and kinetic Monte Carlo simulations complement these experimental activities. NPRE researchers study nuclear fuel such as urania, including mass transport and

mechanical property studies. Tangentially related work exists in studying hydrogen in metals, including hydride phase formation and solute dislocation pipe diffusion. Research also includes materials far from equilibrium and in extreme environments, such as extreme properties of liquids, various glassy materials, and soft materials.

Included are application of both advanced materials characterizations using neutron and synchrotron light at the national laboratories and atomistic modeling and simulation.



Nuclear power research covers all aspects of nuclear power generation, including reactor physics, thermal-hydraulics, safety, reliability and risk, instrumentation and control, training

and education, human factors engineering, reactor materials, nonproliferation, etc. Safety and continued operation of existing reactors and new reactor designs are explored. Cross-cutting areas of research include multi-physics and multi-scale modeling and simulation, high performance computing, reliability and risk, validation and verification, and uncertainty analysis.

Plasma physics/fusion research themes cover magnetic and inertial nuclear fusion as well as plasma engineering. The five research themes that span this work are: fusion materials, plasma-material interface (PMI) diagnostics, plasma-edge and PMI modeling, plasma nanosynthesis and plasma sources and processing.

Radiological sciences research focuses on developing techniques that use ionizing radiation for detection for homeland security and nuclear safeguards, as well as for biomedical research and healthcare. Researchers develop gamma-ray, x-ray and neutron detectors and imaging detectors, and algorithms for analyzing data. NPRE researchers develop advanced diagnostic imaging and radiation-induced therapeutic approaches to address critical healthcare-related issues.

Reliability/Risk research focuses on Probabilistic Risk Assessment (PRA) for the risk-informed nuclear regulatory framework. Work includes developing multidisciplinary PRA and a common vocabulary within diverse engineering and social science domains to enhance prevention of catastrophic accidents and protect the environment.



Location: College Park, MD
Website: <https://www.umd.edu>
Department: Department of Mechanical Engineering,
Center of Risk and Reliability
Department Website: <http://crr.umd.edu>
<https://radiationumd.edu>
Point of Contact: Katrina Groth
kgroth@umd.edu
301-405-5215



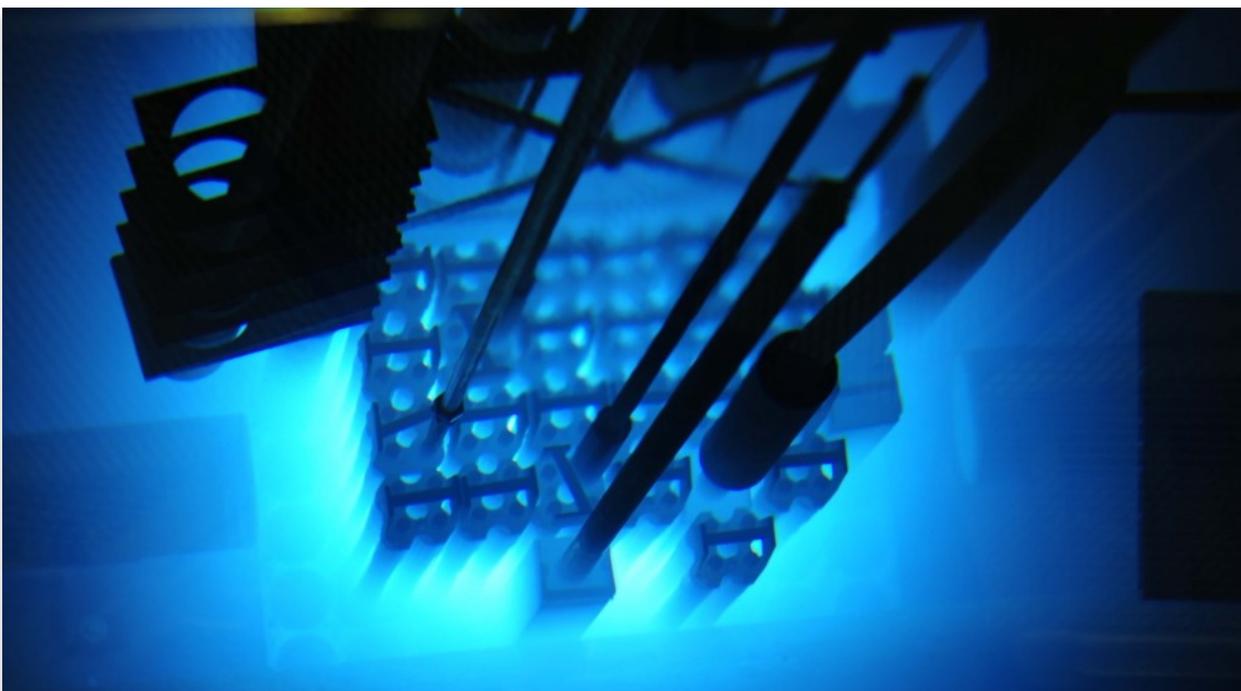
The University of Maryland's A. James Clark School of Engineering conducts research in the areas of nuclear safety, risk and reliability, materials engineering, and radiological science. UMD research occurs throughout the Clark school, with major emphasis in the Center for Risk and Reliability (housed in the Department of Mechanical Engineering), and the Radiation Facilities (housed in the Department of Materials Science and Engineering)

Safety, risk and reliability research in the Center for Risk and Reliability (CRR) draws expertise from 15 faculty spanning the Clark School's various departments. CRR provides research leadership in the development of fundamental risk and reliability science and new frontiers in safety, security, risk and reliability studies that includes probabilistic risk assessment, data analytics, machine learning, prognostics and health management, complex engineering systems and structures, human reliability analysis, cybersecurity, and resilience engineering.

CRR's laboratories include System Risk and Reliability Analysis (SyRRA), Cybersecurity Quantification (CQ), Hybrid Systems Integration and Simulation (HSIS), and Probabilistic Physics of Failure and Fracture (PPoFF) laboratories. CRR is the research arm of UMD's reliability engineering educational program, largest and most comprehensive M.S. and Ph.D. degree granting reliability engineering program in the U.S.

UMD's Radiation Facilities house the Maryland University Training Reactor (MUTR), a panoramic Co-60 irradiator, and an electron linear accelerator (LINAC). The MUTR is a very early model 250 kW General Atomics low enrichment uranium TRIGA reactor that was installed in 1970 as an upgrade from a 10 kW HEU Materials Testing Reactor previously installed in 1960. The UMD NRC license is #70 (Docket R-70). The facilities support teaching, research, and service for UMD as well as many collaborators including many national laboratories and other prestigious institutions. The Dry Cell Gamma Irradiator allows for the irradiation of a wide variety of sample sizes with dose rates that range from just a few krad/hr to over one Mrad/hr. The LINAC is a modified Varian Clinac-6 (V7715) with a variable electron beam energy from 2 to 10 MeV, which provides 1 kW of beam power through moderating the beam current. Experimental activities include gamma and neutron irradiation in the reactor, high dose rate gamma or electron irradiations, a thermal neutron imaging station, and neutron activation analysis.

A major focus of UMD's Radiation Facilities educational efforts is preparing undergraduate students for the safe and reliable operation of our training reactor. A reactor and radiation measurements class is offered as part of the nuclear engineering undergraduate minor.





Location: Salt Lake City, UT

Website: www.utah.edu

Department: College of Engineering, Department of Civil and Environmental Engineering, Nuclear Engineering

Department Website: <https://www.nuclear.utah.edu>

Point of Contact: Courtney Phillips
courtney.phillips@utah.edu



The University of Utah

Housed within the Department of Civil and Environmental Engineering (CVEEN) at the University of Utah, the Utah Nuclear Engineering Program (UNEP) has two separate graduate degrees (M.S. non-thesis and Ph.D. in Nuclear Engineering) as well as an undergraduate minor. As part of Utah's flagship research university and proud member of the Pac-12 Conference, UNEP is responsible for educating the next generation workforce in critical nuclear engineering fields and developing innovative procedures and technologies for the advancement of nuclear applications.

Our areas of specialization encompass neutron activation, radiation detection, radiochemistry, actinide chemistry, nuclear material performance, numerical modeling of nuclear infrastructure, and isotope production and nuclear medicine. Our graduates have a well-rounded background in Nuclear Principles and



Engineering covering Radiation Interactions, Reactor Physics, Health Physics, Nuclear Instrumentation as well as additional research specific elective classes. We operate a 100 kW TRIGA Reactor with thermal irradiation and fast irradiation ports.

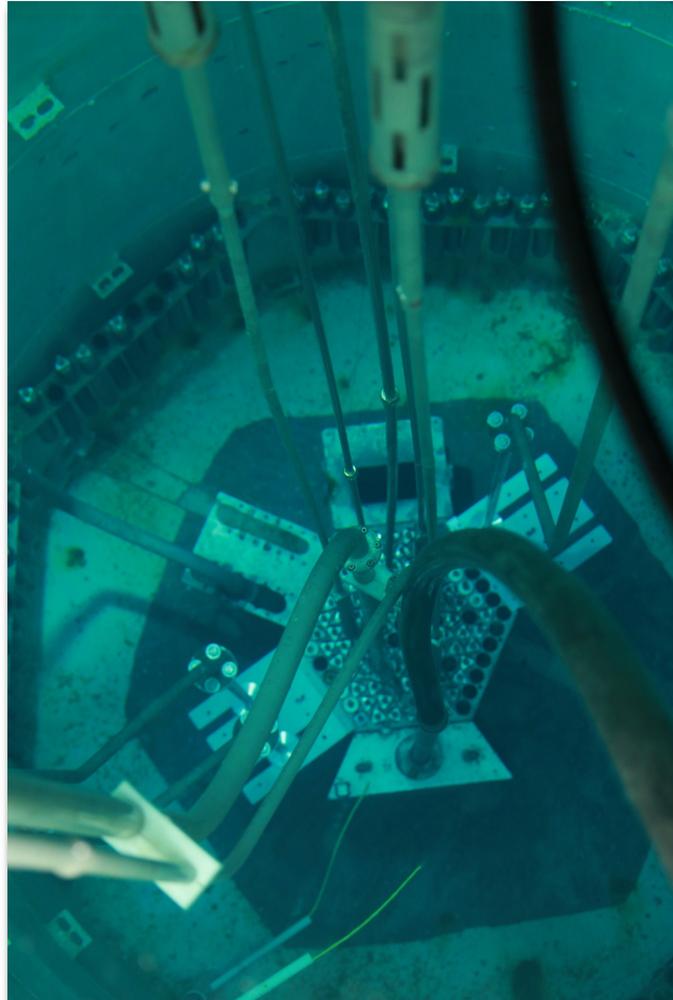
UNEP faculty research is grouped into four areas: nuclear materials and structural analysis, actinide chemistry and radiochemistry, neutron activation and radiation detection, and isotope production and nuclear medicine. The Nuclear Materials and Structural Analysis area collaborates with the structural engineering area within CVEEN.

They have focused research capabilities on seismic assessment and monitoring of nuclear structures, risk assessment of storage and transportation, BISON mechanical capabilities, nuclear fuel synthesis, neutron and gamma damage experimentation, analysis and modelling and post-irradiation sample testing.

The actinide chemistry and radiochemistry research included detonation nuclear forensics, f-element compound synthesis and thermodynamic measurements, synthesis and evaluation of novel resins for separation of actinides and lanthanides, production of high purity targets for heavy actinide production (Am and Pu), radionuclide transportation modelling and remediation strategies.

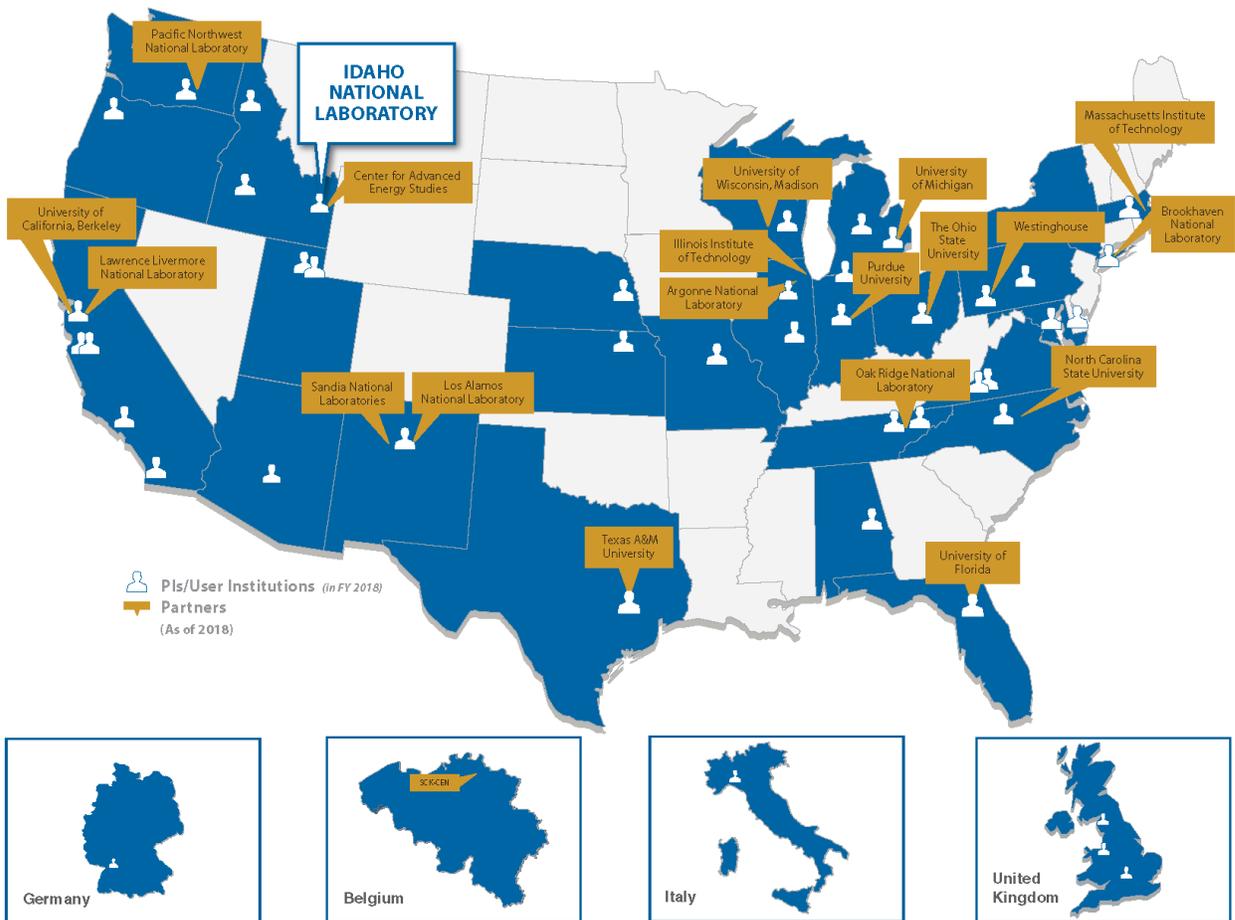
The third area of neutron activation and radiation detection includes detector development and testing, radiation hardness experimentation, development of electronics for radiation applications, in-situ gamma and neutron testing, radiation transport simulations, and environmental monitoring of trace contaminants.

Isotope production and nuclear medicine is the final area that includes production and separation of radionuclides for imaging and treatment of cancer and other diseases, targeted radiotherapy applications, PET/SPECT imaging applications, and production of actinides including Pa, Np, Pu, and Am.

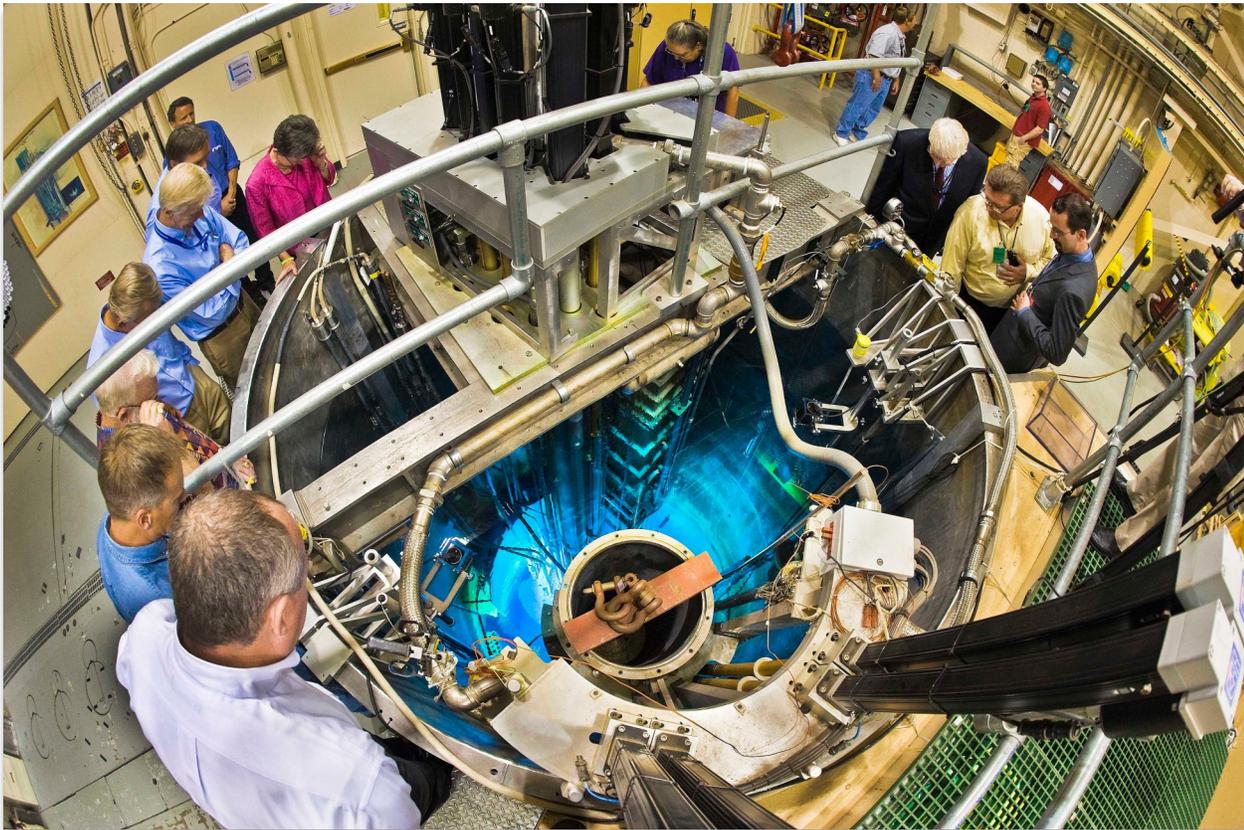


UNIVERSITY RESOURCES

The Nuclear Science User Facilities (NSUF) offers unparalleled research opportunities for nuclear energy researchers. Users are provided access (at no cost to the researcher) to world-class nuclear research facilities, technical expertise from experienced scientists and engineers, and assistance with experiment design, assembly, safety analysis and examination.



Location: Idaho Falls, ID
Website: www.nsf.inl.gov
NSUF Director: Rory Kennedy
Point of Contact: Tiffany Adams
tiffany.adams@inl.gov
208-526-4081



Sandia Annular Core Research Reactor

Access to NSUF's 49 facilities at 21 partner institutions is awarded through two competitive peer-reviewed processes, Consolidated Innovative Nuclear Research (CINR) and the Rapid Turnaround Experiment (RTE). NSUF staff is available to help any researcher who desires to submit a proposal. Submitted proposals should be consistent with the DOE-NE mission and its programmatic interests. These include light water reactor sustainability, fuel cycle research and development, advanced modeling and simulation, and advanced reactor technology programs. All NSUF research must be non-proprietary and results are expected to be published.

Nuclear Science and Engineering Education Sourcebook 2018

[Nuclear S.E. Education Source Book 2018](#)

Nuclear Science and Engineering Education Sourcebook 2018



US Department of Energy



American Nuclear Society

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