PROGRAM IN NUCLEAR ENGINEERING

The world’s growing need for energy requires a diversity of energy sources, including nuclear energy. Approximately 20% of the electricity used in the U.S. stems from nuclear power. As power plants continue to age there is a need to develop next-generation nuclear reactors and to educate future generations of nuclear scientists and engineers. The demand for nuclear engineers is projected to significantly outpace supply during the next decade. For more information please see our web page at www.uidaho.edu/idahofalls/nuclearengineering/.

Admissions Requirements and Procedures

The minimum requirements to enter any of the graduate programs in nuclear engineering are: an undergraduate degree in engineering or closely related field from an ABET accredited U.S. program, does not include technical degrees; and a cumulative GPA of 3.0 or better on a 4.0 scale. GRE General Exam is recommended but not required for students with a cumulative GPA of 2.5 or better on a 4.0 scale. TOEFL (minimum score: computer based 80, paper based, 560) is required for all foreign applicants. Applicants to the graduate programs are reviewed on a case-by-case basis by the program’s Graduate Committee. Some applicants who have a baccalaureate degree in a field other than engineering may be required to complete certain undergraduate deficiency courses before they will be allowed to take graduate level courses.

Richard Christensen, Program Director (UI Idaho Falls, 1776 Science Center Dr., Idaho Falls, ID 83402; 208-533-8012; rchristensen@uidaho.edu; www.uidaho.edu/idahofalls/nuclearengineering/.

*BORRELLI, Robert A; 2015; Assistant Professor of Nuclear Engineering; Ph.D.; 2006; University of California-Berkeley.

*CHRISTENSEN, Richard N; 2015; Professor in Nuclear Engineering; Director, Nuclear Engineering Program; Ph.D.; 1974; Stanford University.

DUNZIK-GOUGAR, Mary Lou; 2017; Adjunct Faculty in Nuclear Engineering; Ph.D.; 2003; Pennsylvania State University.

GOUGAR, Hans; 2017; Adjunct Faculty in Nuclear Engineering; Ph.D.; 2004; Pennsylvania State University.

IMEL, George; 2017; Adjunct Faculty in Nuclear Engineering; Ph.D.; 1977; Pennsylvania State University.

KERBY, Leslie; 2017; Adjunct Faculty in Nuclear Engineering; Ph.D.; 2015; University of Idaho.

KUNZE, Jay; 2017; Adjunct Faculty in Nuclear Engineering; Ph.D.; 1959; Carnegie Mellon University.

MONTIERTH, LeLand M; 2014; Adjunct Faculty of Nuclear Engineering; Ph.D.; 1982; University of Arizona.

POPE, Chad; 2017; Adjunct Faculty in Nuclear Engineering; Ph.D.; 2011; Idaho State University.

SCHULTZ, Richard R; 2017; Adjunct Faculty in Nuclear Engineering; Ph.D.; 2010; Idaho State University.

WACHS, Daniel M; 2016; Adjunct Faculty in Nuclear Engineering Program; Ph.D.; 2002; University of Idaho.

WEN, Haiming; 2017; Adjunct Faculty in Nuclear Engineering; Ph.D.; 2012; University of California.

Nuclear Engineering Graduate Program

Candidates must fulfill the requirements of the College of Graduate Studies and of the Nuclear Engineering Committee. See the College of Graduate Studies (https://catalog.uidaho.edu/colleges-related-units/graduate-studies) section for the general requirements applicable to each degree. These degrees are offered only through the graduate program at the University of Idaho Center, Idaho Falls. Consult the center’s bulletin for specific details.

- Nuclear Engineering (M.S.) (https://catalog.uidaho.edu/colleges-related-units/engineering/nuclear-engineering/nuclear-engineering-m)
- Nuclear Engineering (Ph.D.) (https://catalog.uidaho.edu/colleges-related-units/engineering/nuclear-engineering/nuclear-engineering-phd)

Nuclear Engineering

NE 400 (s) Seminar
NE 404 (s) Special Topics
NE 404 (s) Special Topics (cr arr).
NE 437 Radiation Effects on Materials
NE J437/J537 Radiation Effects on Materials (3 cr)

NE 438 Fundamentals of Nuclear Materials
NE J438/J538 Fundamentals of Nuclear Materials (3 cr)

NE 450 Principles of Nuclear Engineering
NE R450 Principles of Nuclear Engineering (3 cr)

Basic nuclear and atomic processes; radioactive decay, binding energy, radiation interactions, reaction cross sections. Neutron diffusion, radiation sources.

Prereq: Math 310, Engr 320, or Permission.
NE 498 (s) Internship
NE 499 (s) Directed Study
NE 500 Master's Research and Thesis
NE R500 Master's Research and Thesis (cr arr).
NE 501 (s) Seminar
NE R501 (s) Seminar (cr arr).
NE 502 (s) Directed Study
NE R502 (s) Directed Study (cr arr).
NE 504 (s) Special Topics
NE 504 (s) Special Topics (cr arr).
NE 511 Nuclear Degradation Mechanisms
NE 511 Nuclear Degradation Mechanisms (3 cr)
See MSE 511.

NE 512 Nuclear Components Inspection
NE 512 Nuclear Components Inspection (3 cr)
See MSE 512.

NE 514 Nuclear Safety
3 credits
Cross-listed with TM 514. An in-depth technical study of safety issues within the nuclear fuel cycle and within various reactor types. Evaluation methods, system disturbances, safety criteria, containment, NRC licensing, and codes for safety analysis will be presented. Case studies of reactor accidents and corrective measures included.
Prereq: Permission.

NE 516 Nuclear Rules and Regulations
3 credits
Cross-listed with TM 516. An in-depth examination of nuclear regulatory agencies; major nuclear legislation; current radiation protection standards and organizational responsibility for their implementation.
Prereq: Permission.

NE 520 Thermodynamics of Nuclear Power Plants
NE 520 Thermodynamics of Nuclear Power Plants (3 cr)
Course covers applications of First Law to power nuclear plants: boiling water, pressurized, high temperature gas, small modular and advanced nuclear power plants. Nuclear power plant applications of pressurizers, suppression pools, nuclear containment, the application of the Second Law to exergy analysis of advanced fuel cycles.
Prereq: Permission.

NE 524 Heat Exchanger Design
NE 524 Heat Exchanger Design (3 cr)
This course will cover advanced heat exchanger design and apply that knowledge to the design of the following heat exchangers: tube-in-tube heat exchanger, air cooler, compact heat exchanger, feedwater heater and condenser.
Prereq: Permission.

NE 529 Risk Assessment
3 credits
Cross-listed with TM 529. In-depth evaluation and analysis techniques used to determine the risk of industrial, process, nuclear, and aviation industries; fault tree analysis; human reliability analysis; failure mode and effect analysis.

NE 530 Two-Phase Flow
NE 530 Two Phase Flow (3 cr)
Treatment of fluid mechanics and heat transfer in conjunction with nuclear reactors where two-phase flow problems are found.
Prereq: Permission.

NE 535 Nuclear Criticality Safety
3 credits
Cross-listed with TM 513. Nuclear criticality safety including nuclear physics, fusion and neutron multiplication, moderation and reflection of neutrons, criticality issues in the fuel cycle, critical experiments and sub-critical limits, calculations of criticality, nuclear criticality safety practices, emergency procedures, and nuclear regulations and standards.
Prereq: NE 450 or Permission.

NE 537 Radiation Effects on Materials
NE 537 Radiation Effects on Materials (3 cr)
See MSE J437/J537.

NE 538 Fundamentals of Nuclear Materials
NE 538 Fundamentals of Nuclear Materials (3 cr)
See MSE J438/J538.

NE 551 Nuclear Reactor Fuels
NE 551 Nuclear Reactor Fuels (3 cr)
See MSE 550.

NE 554 Radiation Detection and Shielding
3 credits
Prereq: Math 510 or Permission.

NE 555 Nuclear Criticality Safety II
NE R555 Nuclear Criticality Safety II (3 cr)
Applications of criticality safety techniques to facility design and review, requirements for unique isotopes, criticality safety evaluations, connections to nuclear materials management, applications of monte carlo analysis.
Prereq: NE 535 or Permission.

NE 556 Reactor Engineering
NE R556 Reactor Engineering (3 cr)
Radiation shielding, materials, instrumentation and controls, separation of stable isotopes, chemical separation and processing, special techniques.
Prereq: Math 480 or Permission.

NE 557 Advanced Nuclear Systems and Modeling
NE 557 Advanced Nuclear Systems and Modeling (3 cr)
Comprehensive information about nuclear systems (such as, nuclear steam supply systems, safety systems, etc) and analytical modeling of nuclear systems. Description of reactor technologies (such as, Boiling Water Reactor –BWR- and Pressurized Water Reactor –PWR- systems and corresponding modeling and performance of the systems. Reactor thermal hydraulics models/tools are used to model the systems. Course projects are defined for practicing modeling techniques.
Prereq: NE 555.

NE 558 Nuclear Chemical Engineering
NE R570 Nuclear Chemical Engineering (3 cr)
Chemical engineering processes related to the nuclear industry; metals dissolution, solvent extraction, isotope separation, uranium processing and other topics.
Prereq: Permission.

NE 559 (s) Internship
NE 559 (s) Internship (cr arr).

NE 565 Reactor Engineering
NE R565 Reactor Engineering (3 cr)
Radiation shielding, materials, instrumentation and controls, separation of stable isotopes, chemical separation and processing, special techniques.
Prereq: Math 480 or Permission.

NE 567 Advanced Nuclear Systems and Modeling
NE 567 Advanced Nuclear Systems and Modeling (3 cr)
Knowledge of advanced nuclear systems (such as, nuclear steam supply systems, safety systems, etc) and analytical modeling of nuclear systems. Description of reactor technologies (such as, Boiling Water Reactor –BWR- and Pressurized Water Reactor –PWR- systems and corresponding modeling and performance of the systems. Reactor thermal hydraulics models/tools are used to model the systems. Course projects are defined for practicing modeling techniques.
Prereq: NE 555.

NE 570 Nuclear Chemical Engineering
NE R570 Nuclear Chemical Engineering (3 cr)
Chemical engineering processes related to the nuclear industry; metals dissolution, solvent extraction, isotope separation, uranium processing and other topics.
Prereq: Permission.

NE 575 Advanced Nuclear Power Engineering
NE R575 Advanced Nuclear Power Engineering and Capstone (3 cr)
Present and advanced nuclear power plant descriptions and analysis. Engineering aspects of converting nuclear fission energy to useful work. Group project design.
Prereq: Permission.

NE 598 (s) Internship
NE 598 (s) Internship (cr arr).

NE 599 (s) Research

NE 600 Doctoral Research & Dissertation
NE 600 Doctoral Research and Dissertation (cr arr).