NSE Graduate Handbook
School of Nuclear Science and Engineering

Oregon State University

Todd S. Palmer

OSU Nuclear Science and Engineering

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Welcome!

Welcome to Oregon State University (OSU) and the School of Nuclear Science and Engineering (NSE). This handbook is intended to help you get settled and answer some of the questions you might have as a new graduate student in the school. If, after reading the contents, you have unanswered questions, please feel free to ask for help. The staff, faculty, and fellow graduate students in the Radiation Center and in the School are available and willing to help solve any issues as they arise. Additional information on deadlines, procedures and requirements is provided by the current Oregon State University Catalog and Guide to Success which may be obtained from the Graduate School: `http://oregonstate.edu/dept/grad_school/`.

Graduate students in NSE are responsible for complying with the rules of the University, the Graduate School, and NSE. In some instances, the requirements of NSE are more restrictive than those of the Graduate School. In such cases, the school requirements specified in this document will apply.

The program requirements that an NSE student must satisfy for a graduate degree are those contained in the version of the Handbook and/or Catalog that is current at the time of your matriculation into the program. You and your graduate advisor should consult the correct handbook version for appropriate guidelines.

The faculty hopes that your time at OSU will be rewarding, memorable, and the beginning of a fruitful career in the nuclear sciences and engineering fields.

Dr. Todd S. Palmer, Professor and Associate School Head
Graduate Committee Chair
School of Nuclear Science and Engineering

Contents

1 Getting Settled

The School of Nuclear Science and Engineering (NSE) resides in the Radiation Center (RC) – the facility that houses OSU's TRIGA nuclear research reactor. The RC is an instructional and research facility specially designed to accommodate programs involving the use of radiation and radioactive materials. This unique facility was designed and established to accommodate internal and off-campus instructional and research programs involving nuclear engineering, nuclear science, radiation protection, nuclear chemistry, and other related areas.

1.1 Radiation Center Orientation Program

The RC conducts a general occupational and radiation safety orientation and training program for all individuals housed in the RC. You must complete the orientation process in order to obtain keys or an After-Hours Work Permit, which authorizes you to be in the RC outside of normal business hours (8 am – 5 pm, Monday through Friday). Please see the RC Administrative Assistant in C100 for more complete instructions on obtaining keys and an After-Hours Work Permit if you miss the orientation session.

The security of your keys is quite important for everyone's safety in the RC. It is imperative that any loss of keys be reported immediately to C100. You are requested to exercise the utmost care in the use of your keys. Under absolutely no circumstances are keys to be loaned to other individuals. Graduate students who will be absent from the RC during the summer should leave their keys with the RC Administrative Assistant in C100. This will minimize loss and facilitate the summer key inventory. In addition, keys must be returned when you finish your residency at the RC. Let the RC Administrative Assistant in C100 know of your pending departure at least a week in advance so the proper exit procedures can be followed.

Campus Security patrols the RC periodically outside of business hours (5 pm – 8 am). Anyone without an After-Hours Work Permit and valid photo ID will be required to leave the building. Office and laboratory doors and windows are to be kept closed and locked when not occupied. Security patrols will lock any open, vacant rooms. Do not let anyone into the building after hours. Individuals who are authorized to be in the building after hours are issued appropriate access codes and keys. Guests or family members are not allowed in the RC after hours. Anyone abusing this system will have his/her After-Hours Work Permit revoked.

1.2 Graduate Student Offices

NSE graduate student offices are located throughout the RC, and more recently, in Batcheller Hall. Offices are assigned to returning students, and then to new students as they arrive on campus. There are limitations to space, therefore not all students will be granted office space. Students on graduate research or graduate teaching assistant appointments will be given preference, with remaining students placed as space permits. Offices space for PhD students is also prioritized over office space for Masters students. For office assignments, see the Graduate Program Chair or the Graduate Student Liaison. Once placed, please do not change your office space without the Graduate Program Chair's approval.

1.3 Mailboxes

Each graduate student is assigned a mailbox in C corridor at the front of the building. U.S. mail is delivered once a day. Campus mail arrives twice daily at about 10:30 am and 2:30 pm. U.S. and campus mail drops are located in front of A100. Please check your mailbox regularly for notices, telephone messages, departmental circulars, and other information.

1.4 Advisor/Major Professor

The Graduate Program Director will act as or appoint an advisor for all incoming graduate students until a major professor is selected.

Make an initial appointment to see your advisor prior to registering. Your advisor will help you plan your schedule and make sure requirements are fulfilled. You are, however, ultimately responsible for seeing that you have fulfilled all the requirements necessary for graduation. It is the responsibility of each student to propose a viable program and to ask a faculty member to become his/her major professor. A major professor must be chosen before the completion of 18 credits, typically by the end of your second term at OSU. The choice of a major professor should be given considerable thought, since you will have a close working relationship with this individual for the duration of your degree program, and close professional and personal contacts thereafter.

Your major professor will guide your research efforts to completion and oversee all aspects of your graduate studies. The student is also responsible for actively seeking information about individual research projects. Good sources of information are the professors themselves or their graduate students.

1.5 Computer Use

In general, most of the large computer codes used in the School have been moved to the UNIX system where their performance is maximized. The UNIX system should be used primarily for solving large-scale problems, software development, and symbolic mathematics. The PC-based computers should be used primarily for word processing, spreadsheet, and Internet connectivity applications.

School computers are supplied to allow you to perform your research activities and course work, and should not be used for games or other personal uses during normal business hours (8:00 am - 5:00 pm, Monday – Friday). After hours personal use, within reason (as described by University policy), is allowed as long as others do not need the computers for their research or class activities. Computer use supporting funded research takes priority over use for non-funded research.

Room A124 is divided into two sections: a computer laboratory reserved primarily for undergraduate student class and project work, and a set of tables near the entrance designed for graduate student work. Occasional, short-term use of the computer resources in this room by graduate students is permitted on an as available basis.

If someone is using a computer for an application which is inappropriate, or falls under a low priority, kindly request that they terminate their work in a reasonable period of time. In any case no more than 15 minutes should be needed to terminate the work on a lower priority application. If you are asked to terminate your work on a lower priority application, please stop work as soon as you can (again, in no more than 15 minutes).

Do not copy ANY software onto the School's computer hard disks without approval from the School Head and the Network Administrator. Software licensing and disk space availability are two issues that must be considered. The installation of your own personal copies of software on the School's machines without permission exposes the School to an unacceptable potential liability and therefore cannot be allowed. Please ask permission for the installation and use of your personal software if it is important to your research or course work. Also, please do not copy any software from the School's computers without permission. This, again, violates software licensing agreements.

If you have any general questions about using University computers, please contact Chris Thompson in A-114 or at `support@engr.orst.edu` for assistance, or refer to the University's Policy on Acceptable Use of University Computing Facilities at these web sites: `http://engineering.oregonstate.edu/computing/`

1.6 Parking

A valid OSU Zonal Parking permit is required to park in any space on campus. The OSU Zonal Parking system includes seven general use zones (A1, A2, A3, B1, B2, B3, C), and two residence hall parking zones (BR, CR). The Radiation Center parking lot is designated zone B3, while parking on Jefferson Way west of SW 35th Street is designated zone C. Permits can be purchased online at the Parking Services website: `http://parking.oregonstate.edu` or in person at the Parking Services office in 100 Adams Hall. Please refer to the Parking Services website for the Parking and Shuttle Map as well as permit pricing. Parking Services can also be reached by phone at (541) 737-2583.

1.7 Smoking

Smoking is not allowed on the Corvallis campus. This includes the Radiation Center. Please consult the map on the following webpage for the campus boundary: `http://oregonstate.edu/smokefree/map`

1.8 Radiation Center Library

The RC Reference Library is located in A124. Materials are not to be checked out and cannot be removed from the library. Please DO NOT re-shelve any materials you use but rather put your books in the designated area with the sign that reads âĂIJPlease return materials here.âĂİ The RC receptionist will re-shelve materials to their proper place. If you wish to add books or documents to the library, please give the material to the RC receptionist who will be maintaining the library. The receptionist can catalog the new material and place it in the correct location. Keep the library clean and tidy up after yourself.

1.9 General Safety Guidelines

In order to comply with state and university fire prevention codes, the RC has adopted a policy which prohibits the use of personal coffee pots, hot plates, or other heating devices designed to heat water for coffee, tea, hot chocolate, etc. A refrigerator, coffeepots, hot water dispenser, and a microwave, can be found in the break-room, B134. No one should stay “overnight” in the building.

The last person to leave a room after 5:00 pm is required to check to see that all windows are closed and that door(s) are locked.

First aid kits and emergency eye wash stations and fire extinguishers are located at various places throughout the Radiation Center on the walls. Names of Radiation Center personnel qualified to administer first aid are also listed as part of the first aid kits. All injury accidents are to be reported to OSU’s Office of Environmental Health and Safety on forms available from the Business Manager in A102.

Building evacuation drills will be conducted during the year. Please familiarize yourself with the evacuation signals and procedures. These are posted at numerous locations throughout the Radiation Center.

If you have questions regarding any of the above or any other safety matters, contact the RC Director.

2 Special Services at Oregon State University

2.1 Campus Resource Guide

Graduate Success Center is service available to Graduate Students and faculty. For details, please visit `http://gradschool.oregonstate.edu/graduate-student-success`

2.2 Oregon State University Student Branch of the American Nuclear Society

OSU has a very active student branch of the American Nuclear Society (ANS). Officers are elected once each year. Contact the Faculty Advisor (Dr. Haori Yang) for information on the student chapter of the ANS.

National ANS student member dues are currently $30.00 (your first year is paid by the School) and benefits include:

- Twelve issues of Nuclear News
- ANS News, the newsletter on Society and member activities
- ANS Placement Services
- Special registration rates for ANS meetings
- Opportunity to present papers
- Opportunity to meet with others pursuing similar interests
- Membership in two ANS professional divisions or technical groups
- Membership subscription rates to the Society's technical publications (Nuclear Technology, Fusion Technology, Nuclear Science and Engineering, Transactions, and Remote Systems Technology Proceedings). item Various honors and awards

The application form is available online at `http://ans.org/`

2.3 Oregon State University Student Branch of the Health Physics Society

In 1993, students in the radiation health physics program at OSU organized a student chapter of the National Health Physics Society. The Society's objective is to develop "scientific knowledge and practical means for protection of man and his environment from the harmful effects of radiation." The organization provides technical information and information about the business of radiation protection in its monthly publication, Health Physics journal and the Health Physics News newsletter. OSU Chapter officers are elected once each year. Contact the Faculty Advisor (Dr. Haori Yang) for information on the student chapter of the HPS.

National student membership in the Health Physics Society qualifies students for membership in the student chapter as well. National Health Physics Society student membership dues are free for the first year then continue at $10 per year and benefits include:

- 12 issues of Health Physics
- The Health Physics Society's newsletter
- Health Physics Society job placement services
- Opportunities for fellowships
- Opportunities for registration and travel assistance for HPS meetings

- Chapter social activities

Membership in the student chapter is open to individuals in the NSE and NE programs, as well as students with an interest in health physics. For a membership application contact the website at http://hps.org/

2.4 American Chemical Society (ACS)

Students in the Radiochemistry research program are advised to join the Division of the Nuclear Chemistry and Technology of the American Chemical Society: http://www.acs.org/ It is a nonprofit organization, chartered by Congress, and with more than 161,000 members, ACS is the world's largest scientific society and one of the world's leading sources of authoritative scientific information.

The first year graduate student membership is $38.50 USD and covers 12 issues of the Chemical Engineering News (CEN) magazine and the Nuclear Chemistry and Nuclear Technology Division Newsletter. As a member of the ACS, you will have a free access to:

- Networking: Special registration fees for national ACS meetings and regional conference; opportunities for travel assistance for ACS meetings; communicate with other members and finding scientific collaborations, get information about the latest research, participate in the ACS public forums, groups and personal blogs.
- Internships & Opportunities: ACS provides its members with the resources and opportunities needed to enrich their programs of study.
- Research & Publications: Stay up-to-date in world chemical news and breakthroughs in research with ACS publications.
- Jobs: ACS offers its members a variety of educational and professional development resources to help advance their careers.

2.5 Oregon State University Chapter of the Institute of Nuclear Materials Management

In 2015, NSE created a nationally recognized Student Chapter of the Institute of Nuclear Materials Management. The Institute of Nuclear Materials Management (INMM) is an international professional society dedicated to development and promulgation of practices for the safe, secure and effective stewardship of nuclear materials through the advancement of scientific knowledge, technical skills, policy dialogue, and enhancement of professional capabilities. Nuclear materials management involves the production, use, storage, transport, handling, protection, accounting and other essential aspects involved with the fundamental elements of the civilian nuclear fuel cycle, most notably, uranium and plutonium.

Student memberships are $30 annually (the first year is paid by the School of NSE), and student members receive an online subscription to the Journal of Nuclear Materials Management (a $100 value), the INMM Membership Directory, access to the Members' Only section of the INMM Web site, opportunities to participate in student award competitions, and much more. OSU Chapter officers are elected once each year.

Contact the Faculty Advisor (Dr. Camille Palmer) for information on the student chapter of the INMM. Membership in the student chapter is open to all individuals in the School of NSE, and any other student with an interest in this sub-discipline. For a membership application visit the website: http://www.inmm.org.

Figure 1: Radiation Center Map

3 NSE Faculty

3.1 Seth Cadell

Assistant Professor/Senior Research. Ph.D. Nuclear Engineering, Oregon State University (2013).

Cadell completed his doctoral studies at Oregon State University before working as an engineer at NuScale Power from 2012-2016. He now manages the High Temperature Test Facility–ensuring the instruments are calibrated, the facility is operational, and configured appropriately for each test. He works with a group of approximately 10 NSE students to accomplish these tasks.

At OSU since 2016.

3.2 Abi T. Farsoni

Associate Professor. B.S. Applied Physics (1992), University of Tehran; M.S. Nuclear Engineering (1999), Sharif University of Technology; Ph.D. Radiation Health Physics (2006), Oregon State University.

Esfahan Nuclear Technology Center (1992-2000). Radionuclide expert, National Nuclear Security Administration (2005-present). At Oregon State University since 2006. Fields of interest: health physics, neutron activation analysis, radiation detection and spectroscopy, advanced digital readout electronics, digital signal processing, nuclear detection systems for homeland security.

3.3 Izabella Gutowska

Assistant Professor/Senior Research. Ph.D. Nuclear Engineering, Oregon State University (2015).

A 2012 Fulbright Scholar from Poland, Gutowska completed her Ph.D. at Oregon State. She is one of the first nuclear engineering doctoral graduates from Poland since the 1980s. She is working on test facility design, instrumentation and incorporation of system dimensional analysis for the High Temperature Test Facility.

At OSU since 2016.

3.4 David M. Hamby

Professor. B.S. Physics (1984), Mercer University; M.S. Health Physics (1986), Ph.D. Health Physics (1989), University of North Carolina.

Environmental Transport Section, Savannah River Laboratory (1989-1994); Assistant Professor, University of Michigan School Public Health (1994-1999); Faculty Appointee, Argonne National Laboratory (1995-present); Associate Editor, Health Physics (1996present); Editorial Advisory Board, Environmental Monitoring and Assessment (1999-present); Technical Expert, International Atomic Energy Agency (IAEA) in Lithuania (1998); scientific committee member, National Council on Radiation Protection (NCRP). Member, National Health Physics Society, Radiation Research Society; Fulbright Scholar awardee. Funded by the Department of Energy, the Nuclear Regulatory Commission, the Centers for Disease Control and Prevention, NATO, and the U.S. Civilian Research and Development Foundation. At Oregon State University since 1999. Fields of interest: radiation dose assessment, skin dosimetry, radiation instrumentation, environmental health physics, environmental transport, fate and transport model analysis, beta spectroscopy, radiation risk.

3.5 Kathryn A. Higley

Professor and Head, School of Nuclear Science and Engineering. B.A. Chemistry (1978), Reed College; M.S. Radiological Health Sciences (1992), Ph.D. Radiological Health Sciences (1994), Colorado State University.

Environmental radiation monitoring (1976-1979), Trojan Nuclear Power Plant; Environmental Health Physicist (1980-1989), Battelle Pacific Northwest Laboratory. Consultant to U.S. Department of Energy's Office of Environment, Safety and Health, Pacific Northwest National Laboratory, and Argonne National Laboratory. Member, Health Physics Society, International Union of Radioecologists, BIOMOVs II (Biospheric Model Validation Study). President, Environmental Section Health Physics Society (1998-1999), NCRP Scientific Committees, Member, ABHP Panel of examiners, NCRP Council Member, ICRP 7 Committee Member. Elda E. Anderson Award Winner (1995). Certified Health Physicist. At Oregon State University since 1994. Fields of interest: human and ecological risk assessment, environmental pathway analysis, environmental radiation monitoring, radionuclide and hazardous chemical transport, radiochemistry, neutron activation analysis, nuclear emergency response planning, and environmental regulations.

3.6 Andrew C. Klein

Professor. B.S. Nuclear Engineering (1977), Pennsylvania State University; M.S. Nuclear Engineering (1979), Ph.D. Nuclear Engineering (1983), University of Wisconsin.

Editor-Designate, Nuclear Technology, (2013-present); Director, Educational Partnerships, Idaho National Laboratory, Idaho Falls, ID, on loan from Oregon State University, (2005-2009); Board of Directors, American Nuclear Society, (2000-2003 and 2012-2015); Board of Managers, Battelle Energy Alliance/Idaho National Laboratory, (2011-2013); Member, National Nuclear Accrediting Board, Institute for Nuclear Power Operations, Atlanta, GA, (2010-present); Member, Board of Directors, Foundation for Nuclear Studies, Washington, DC, (2009-present);Member, Space Science Advisory Committee, National Aeronautic and Space Administration (2003-2006); Nuclear Energy Research Advisory Committee, U.S. Department of Energy (2001-2005); William C. Foster Fellow U.S. Arms Control and Disarmament Agency (1996); Department Head, Department of Nuclear Engineering and Radiation Health Physics, Oregon State University (1996-2005); Director, Radiation Center, Oregon State University (20022005); Director, Oregon Space Grant Program (1993-2002). Consultant to INL, PNNL, LLNL, ANL, and Thermacore, Inc. Member, American Nuclear Society, Health Physics Society, American Society for Engineering Education, Alpha Nu Sigma, Tau Beta Pi. Registered Professional Engineer (Nuclear). At Oregon State University since 1985. Fields of interest: Nuclear Systems Analysis and Design, Space Applications of Nuclear Technology, Radiation Shielding and Health Physics.

3.7 Dan LaBrier

Ph.D. Nuclear Science and Engineering, Idaho State University (2013)

LaBrier earned his doctorate in nuclear science and engineering form Idaho State University in 2013. He joined NSE after serving as a post-doctoral fellow at the University of New Mexico, with research focusing on the effects of corrosion on the emergency core cooling system for pressurized water reactors (PWR) during loss of coolant accident scenarios, under guidance provided by the Nuclear Regulatory Commission.

His primary research at Oregon State focuses on the behavior of reactor-grade materials under extreme environments. He will initially focus on the occurrence of critical heat flux during power transient events using the Transient Reactor Test Loop (TRTL). At OSU since 2016.

3.8 Wade R. Marcum

Associate Professor. B.S. Mechanical Engineering (2006), M.S. Nuclear Engineering (2008), Ph.D. Nuclear Engineering (2010) Oregon State University.

Faculty Advisor, American Nuclear Society (20112014). Faculty Advisor, Alpha Nu Sigma Honor Society. Member, American Nuclear Society, American Society of Mechanical Engineers. Editorial Board Member, Journal of Nuclear Energy Science & Power Generation Technology. Currently Funded by Department of Energy, National Nuclear Security Administration, the Nuclear Regulatory Commission, the International Atomic Energy Agency, and the Idaho National Laboratory. At Oregon State University since 2010. Fields of interest: experimental and computational thermal hydraulics, reactor safety, multi-physics experimentation and computation, fluid structure interactions, hydro-mechanics, and computational fluid dynamics.

3.9 Guillaume Mignot

Assistant Professor/Senior Research. Ph.D. Nuclear Engineering, University of Wisconsin-Madison (2008)

At OSU since 2017.

3.10 Camille J. Palmer

Associate Professor. Ph.D. Nuclear and Radiological Engineering (option Medical Physics), University of Cincinnati (2003). M.S. Health Physics, University of Cincinnati (1999). B.S. Radiation Health Physics, Oregon State University (1997).

Dr. Palmer serves as the coordinator for the nuclear forensic graduate emphasis within Oregon State's Department of Nuclear Engineering since 2014. Her current efforts are directed toward developing collaborations with national laboratories to form interdisciplinary projects related to national nuclear forensics. Prior to this position, Dr. Palmer was a Research Scientist in the Foreign and Improvised Nuclear Design Group at Los Alamos National Laboratory where she analyzed post-detonation nuclear data for the National Technical Nuclear Forensics (NTNF) team. She has industry experience (2003 âĂŞ 2006) supporting the nuclear hardness and survivability of the US ICBM weapon system. Dr. Palmer was the Medical Physics Program Director at OSU from 2007 – 2011.

3.11 Todd S. Palmer

Professor. B.S. Nuclear Engineering (1983), Oregon State University; M.S. Nuclear Engineering (1989), Ph.D. Nuclear Engineering and Scientific Computing (1993), University of Michigan.

Physicist, Defense Sciences, Lawrence Livermore National Laboratory (1991-1994). Consultant to Lawrence Livermore National Laboratory, Pacific Northwest National Laboratory, Siemens Nuclear Power Corporation. Member, American Nuclear Society. Loyd Carter College of Engineering Teaching Award (2001). Research funding from Department of Energy, Lawrence Livermore National Laboratory, Argonne National Laboratory-West, Pacific Northwest National Laboratory, Portland General Electric, and Nuclear Regulatory Commission. At Oregon State University since 1995. Fields of interest: numerical techniques for particle transport and diffusion, computational

fluid dynamics, reactor physics, general numerical methods, nuclear criticality safety, Monte Carlo methods, transport in stochastic mixtures.

3.12 Alena Paulenova

Associate Professor. Director of Laboratory of Transuranic Elements. Ph.D. Physical Chemistry (1985) Moscow/ Kharkov State University; M.S. Radiochemistry (1991), Comenius University.

INEST Fuel Cycle Core Committee member (2009-2013); Joint faculty in Idaho National Laboratory with the Radiochemistry and Aqueous Separation Division (2008-). International Advisory Board for the Global 2013 conference, Conference on Separation of Ionic Solutes (2003-present); General Manager, âĂIJFoundation CurieâĂİ (1996-2000); Executive Secretary of International Conferences: “Cyclotron Produced Radiopharmaca” (1997) and NATO AIW workshop “Applications of Natural Sorbents in Waste Treatment” (1998). Member of American Chemical Society: Division of Nuclear Chemistry and Technology and the ACS Nuclear Chemistry Summer School committee. Distinguished Member of Editorial Board of the Journal of Radioanalytical Nuclear Chemistry and Editorial Board of the International Journal of Nuclear Energy Science and Engineering; reviewer for Inorganic chemistry, Analytical chemistry, Environmental Science and Technology. At Oregon State University since 2003. Fields of interest: Separation and speciation chemistry of actinides and fission products for: fuel cycle and waste forms; production and application of radiotracers, behavior and mobility of radionuclides in natural bio-geochemical systems; nano-radiochemistry in material science; radiation chemistry and post-irradiation processes.

3.13 Steven R. Reese

Director, Radiation Center. B.S. General Science (1991), Oregon State University; Ph.D. Radiological Health Sciences (1997), Colorado State University.

External dosimetry section (1991-1993), Battelle Pacific Northwest Laboratory; OSU Radiation Safety Office (1997-1998). Reactor Administrator (1998 -2005), OSU Radiation Center. Director, OSU Radiation Center (2005-present). Member, Health Physics Society, American Board of Health Physicists, and American Nuclear Society. At Oregon State University since 1997. Fields of interest: radiation protection, activation analysis, radiation shielding, neutron radiography and dosimetry.

3.14 Jose N. Reyes, Jr.

Currently on assignment at NuScale Power Inc.

Professor; Henry W. and Janice J. Schuette Chair in Nuclear Engineering and Radiation Health Physics, Director, Advanced Thermal Hydraulics Research Lab. B.S. Nuclear Engineering (1978), University of Florida; M.S. Nuclear Engineering (1984), Ph.D. Nuclear Engineering (1986), University of Maryland.

Research Engineer, and Project Manager, U.S. Nuclear Regulatory Commission. Member, USNRC International Code Assessment Program (since 1988); Chairman, ANS Thermal Hydraulic Division. Special Achievement Awards for Outstanding Contributions to the USNRC (1986 and 1987); Austin-Paul Engineering Faculty Award (1990). Thermal Hydraulic Expert, United Nations IAEA (1995). College of Engineering Research Award (1997). College of Engineering Carter Teaching Award (2000), Member, American Nuclear Society, American Society of Mechanical Engineers. Registered Professional Engineer (Nuclear). At Oregon State University since 1987. Fields of interest: thermal hydraulics, multi-phase fluid flow, scaling analyses, ALWR Safety, fluid-structure interactions, reactor system design, and probabilistic risk assessment.

3.15 Brian Woods

Professor. B.S. Mechanical Engineering (1988), University of Virginia, M.S. Nuclear Engineering (1999), Ph.D. Nuclear Engineering (2001), University of Maryland. Nuclear Safety Analyst, Dominion Energy (2000-2003).

Consultant to Idaho National Laboratory, International Atomic Energy Agency. Member, American Nuclear Society. Chair, ANS Thermal Hydraulic Division (2011-2012). President, Alpha Nu Sigma Honor Society National (2009-2011). College of Engineering Research Award (2010). At Oregon State University since 2003. Fields of interest: reactor thermal hydraulics, reactor safety, high-temperature gas reactor design, experimental fluid dynamics and heat transfer.

3.16 Qiao Wu

Professor. B.S. Engineering Physics (1983), M.S. Engineering Physics (1985), Tsinghua University; Ph.D. Nuclear Engineering (1995), Purdue University.

Assistant Professor, Engineering Physics, Tsinghua University (1985-1990). Research Associate, Nuclear Engineering, Purdue University (1995-1997). Member, American Nuclear Society Technical Exchange Delegation to China (1998); Visiting Scientist, Argonne National Laboratory (2001); Scientific Investigator, International Atomic Energy Agency, United Nations (2004). Member, American Nuclear Society. Institute of Multifluid Science and Technology. Technical Reviewer, Science Center of US Department of State. Best Paper Award, ANS Thermal Hydraulics Division (1997). At Oregon State University since 1998. Fields of interest: thermal hydraulics and reactor safety, reactor engineering and design, multi-phase flow and boiling heat transfer, ALWR and IFR stability and safety, thermal hydraulics instrumentation.

3.17 Haori Yang

Assistant Professor. B.S. Engineering Physics (2001), M.S. Engineering Physics (2003), Tsinghua University; Ph.D. Nuclear Engineering and Radiological Sciences (2009), University of Michigan.

Assistant Professor, University of Utah (2011-2013). Research Scientist, Canberra Industries (2008-2010), At Oregon State University since 2013. Fields of interest: non-destructive interrogation techniques, development of innovative radiation sensors, nuclear material detection, detectors for medical imaging, high-energy physics, and nondestructive testing, and general applications of nuclear engineering.

4 Facilities

The School of Nuclear Science and Engineering is housed in the Radiation Center, an instructional and research facility established specifically to accommodate nuclear related research programs, to provide a location for the use of radionuclides and ionizing radiation sources, and to provide sources of fast and thermal neutrons and gamma rays. Major facilities at the OSU Radiation Center include: a 1.1 MW TRIGA research reactor and associated facilities, including a rotating sample rack, a pneumatic transfer irradiation system, a thermal column, in-core irradiation tubes (with and without cadmium), and four beam port facilities; a cobalt-60 gamma-ray irradiator; state-of-the-art digital gamma-ray spectrometers and associated germanium detectors; and various radiochemistry laboratories.

The School of Nuclear Science and Engineering is equipped with state-of-the-art nuclear and radiation protection instrumentation and computing facilities. Computers include a number of PC and UNIX based workstations. The school's computers also provide access through networking to larger computers, such as supercomputing facilities, on and off campus.in addition to radiation facilities, there are laboratories dedicated to the investigation of other phenomena important to the study of nuclear sciences and engineering, including a number of large-scale experimental test facilities.

4.1 TRIGA Reactor

1.1 MW TRIGA Mark II Pulsing Research Reactor is a water-cooled, swimming pool type of research reactor which uses uranium/zirconium hydride fuel elements in a circular grid array. The reactor is licensed by the U.S. Nuclear Regulatory Commission to operate at maximum steady state power of 1.1 MW, and can also be pulsed up to a peak power of about 3000 MW. The reactor has a variety of irradiation facilities available.

4.2 ATHRL

ATHRL – the Advanced Thermal Hydraulic Research Laboratory – incorporates two facilities: the Advanced Plant Experiment (APEX), a three story test facility that assess the safety systems of Westinghouse's next generation of nuclear power plants (AP600, APEX-CE, and AP1000), and the Multi-Application Small Light Water Reactor (MASLWR) test facility, a Generation IV design concept. ATHRL offers excellent opportunities for student research and training in instrumentation, quality assurance, safety, operations, and nuclear and mechanical design.

4.3 ANSEL

ANSEL – The Advanced Nuclear Systems Engineering Laboratory is the home to two major thermalhydraulic test facilities – the High Temperature Test Facility (HTTF) and the Hydro-mechanical Fuel Test Facility (HMFTF). The HTTF is a 1/4 scale model of the Modular High Temperature Gas Reactor. The vessel has a ceramic lined upper head and shroud capable of operation at 850 C (well mixed helium). The design will allow for a maximum operating pressure of 1.0MPa and a maximum core ceramic temperature of 1600 C. The nominal working fluid will be helium with a core power of approximately 600 kW (note that electrical heaters are used to simulate the core power). The test facility also includes a scaled reactor cavity cooling system, a circulator and a heat sink in order to complete the cycle. The HTTF can be used to simulate a wide range of accident scenarios in gas reactors to include the depressurized conduction cooldown and pressurized conduction cooldown events. The HMFTF is a testing facility which will be used to produce a database of hydro-mechanical information to supplement the qualification of the prototypic ultrahigh density U-Mo Low Enriched Uranium fuel which will be implemented into the U.S. High Performance Research Reactors upon their conversion to low enriched fuel. This data in turn will be used to verify current theoretical hydro- and thermomechanical codes being used during safety analyses. The maximum operational pressure of the HMFTF is 600 psig with a maximum operational temperature of 450 F.

4.4 TRUELAB

TRUELAB – the Laboratory of Transuranic Elements – is a state-of-art radiochemical research laboratory, equipped with a variety of instrumentation for characterization of actinides and fission products and their chemical reactivity with organic and inorganic ligands and evaluation of postirradiation changes in solutions: Vibrational spectroscopy (Nicolet Fourier Transformation Infrared and Raman and FTIR and Raman spectroscopy) which allow to characterization of solid and liquid samples, Microcalorimetry (quantification of chemical thermodynamics of studied processes); UV-Vis and NIR spectroscopy (speciation of irradiated solutions, complexation of actinides in aqueous and organic matrices) with the stop-flow cell and syringe titrator; Dionex Ion-exchange and Finnigan liquid chromatography, potentiometric titration, glove box, electrochemistry (cyclic voltammetry). Preparation of samples for LSC and alpha-and gamma spectrometry.

4.5 Other Labs and Facilities

Cobalt-60 Gamma Irradiator; Neutron Radiography facility; Neutron Activation facility, Gamma and Alpha Spectrometry laboratory; Liquid Scintillation Counter (LSC Perkin Elmer); Radiological Instrument Calibration facilities; Thermoluminescent Dosimetry systems; large inventory of radiation detection instrumentation; student computer laboratory; student nuclear instrumentation laboratory; green house and wet chemistry laboratories.

5 Academic Information

5.1 General Information

Graduate students are expected to read the academic policies governing graduate students including, but not limited to, the OSU Catalog, the Graduate School, and the Student Conduct Regulations. The information herein addresses only a few topics regarding those policies.

5.2 Academic Performance

A graduate student is expected to maintain a grade point average of 3.00 or better in (1) each registered quarter, (2) each major or minor field in his/her program, and (3) in his/her overall cumulative graduate program at Oregon State University. Grades below "C" (2.00) cannot be used on a graduate program of study. Failure to maintain these standards is considered grounds for terminating a student's program and/or financial support. See the Dismissal from Graduate School section below for more details. Note that a cumulative GPA of 3.00 is required before the final oral or written exam may be undertaken.

5.3 Graduate Assistantships

Graduate research or teaching assistants are typically appointed for an academic year (9 months), provided the recipient is a graduate student in good standing. Annual performance evaluations will be completed by the graduate student's supervisor, and these evaluations will factor into a student's employability. No appointment can be for less than 0.30 FTE ("full-time equivalence") or more than 0.49 FTE. All graduate assistants are required to carry out the duties assigned by their faculty supervisor to justify their stipend. For example, graduate assistants on a 0.40 FTE appointment are expected to provide an average of 16 hours of service per week. This service is in addition to the time required to complete the thesis research. Graduate assistants at other FTE levels would provide proportional levels of service.

University policy dictates that a graduate assistant must be enrolled for no less than 12 credit hours in any term in which he or she is supported, except for summer term which requires a minimum of 3 credit hours. The College of Engineering

Students who hold more than one job on campus may not work more than a total of 20 hours per week or 255 hours per term for all positions held. Maintaining a GPA of 3.00 or better is required in order for continued financial support.

5.4 Registration

Students register for courses online at the Student Online Services site. For convenience, students should have their proposed schedule (including CRNs) in front of them at the time of registration. The OSU ID number and GAP are required for registration.

Minimum Registration Requirements

- EVERY student must register for a minimum of 3 credits, including
  - Any Summer term in which a student enrolls.
  - The term in which a thesis or dissertation (MS or PhD) is defended or comprehensive oral exam (MHP or MEng) is taken.
  - Any term a student uses university space and facilities or requires supervision of the major professor, regardless of the student's location (on-campus or Ecampus).
- TAs / RAs must register for at least 12 credits (Fall – Spring terms).

  - Auditing a class or enrolling in Continuing Higher Education, Ecampus classes, and other self-support programs may not be used to satisfy enrollment requirements for graduate assistant tuition remission.

- Students receiving financial aid must contact the Financial Aid Office for specific registration requirements per term. Students must notify Financial Aid if they plan on enrolling less than full time.

Maximum Registration Requirements

- Grad students can register for a maximum of 16 credits each term without needing permission. Students should always consult with the major professor about class schedules to ensure proper progression toward the degree.
- Students must receive permission from their major professor and the Grad School to register beyond 16 credits.

Full-Time and Part-Time Enrollment

- Full-time graduate status is an enrollment of 9 credits per term (including summer).
- Financial Aid for part-time graduate students is evaluated on the basis of their part-time enrollment; students must contact Financial Aid for specific requirements.

5.5 Tuition Bills

Students are sent an email to their ONID email account when their statement is ready to view and can then view their eBill statement online at `http://mybill.oregonstate.edu/`. All billing for currently enrolled students is processed electronically through eBill on the 5th of each month.

Unpaid balances as of the 1st of the month following the eBill statement are considered past due, and will be assessed interest at the rate of 1% per month (12% APR). Students are financially responsible for all courses for which they register. Students are responsible for paying fees by the deadline even if they do not receive a bill.

Please direct any questions about tuition, fees, and financial aid to the Business Affairs Office.

5.6 Leave of Absence

You must fill out a Leave of Absence form and have it approved by the Graduate School (at least 15 business days prior to the start of the term) if you need to take off a term (Fall, Winter, or Spring) for any reason.

- You are limited to three leaves of absence during your program. Some students (e.g. Military students called to duty) have more flexibility in the number of leaves allowed by the Graduate School.
- Notify the School's Administrative Assistant if you need to take a leave.
- You never need to fill out a leave form for summer term.
- If you do NOT fill out a leave form, you will have to reapply (including paying the application fee) AND register for 3 graduate credits for each term of the unauthorized break in registration and register for at least 3 credits for the term you are readmitted, e.g., 6 credits for one missed term.

For more information about the Graduate School's policies,

- See the OSU Catalog under "Policies Governing All Graduate Programs" and "Registration Requirements" OR
- Contact the OSU Graduate School at 541-737-4881.

5.7 Health Insurance/Dental Insurance/Immunization Requirements

http://studenthealth.oregonstate.edu/new-students

5.8 Summer Term

The University requires that graduate students who occupy labs, office space, or utilize University facilities during the summer quarter register and pay fees. Graduate Assistants on appointment during the summer term must register for a minimum of 3 credits (full-time enrollment).

5.9 Dismissal from Graduate School

It is imperative that all students read the Student Conduct Regulations to be aware of actions that may lead to the dismissal process: http://catalog.oregonstate.edu/ChapterDetail.aspx?key=38

5.10 Basic Requirements for All Graduate Degrees

- School Seminar: All graduate students are expected to take a School seminar course (NSE 507/607) each enrolled term; this is intended to develop your understanding of the profession and to develop presentation skills. Additional requirements may be set by the student's major or minor professor, by the School, or by the student's advisory committee as needed to strengthen his or her background. Only three seminar credits can be counted toward your Program of Study.
- Graduate Minor: Graduate students in the College of Engineering are not required to pursue a minor. However, if desired, a minor may be selected. Speak with your major professor for more details on minors.
- Research Credits: Graduate students in the School of Nuclear Science and Engineering are not allowed to use NSE 501 or NSE 601 (Research) credits to fulfill requirements on a graduate program of study.
- Thesis Credits: Graduate students pursuing Masters degrees must include 6 CH of NSE 503 (Thesis) on their program of study. PhD students must include 36 CH of NSE 603.
- Program of Study: All students are required to complete a Program of Study outlining the courses they will take to complete their degree requirements. The Program of Study is a contract between the student, the School, and the University (the Graduate School). For degrees within the Master's Program, students must consult and receive approval (signature) from the individual major professor (and minor professor, if seeking a minor). In the case of Doctoral Program degree seeking students, all committee members must approve the Program of Study. Students must then receive the signature of the School Head prior to submitting the form to the Grad School (see Sections: Master's Program and Doctoral Program). The Program form is to be filed before you complete 18 credit hours. Visit the Grad School's "Forms" website for a blank form and instructions on how to fill out the Program of Study. You may need to reference the Graduate School website for further details.

5.11 Research Integrity

The conduct of research is a central educational component for the Masters or Doctoral degrees. The conduct of research bears with it certain ethical and legal responsibilities. It is the expectation of the School that you conduct your research activities with the highest standards of integrity, including compliance with all ethical, regulatory and University requirements. To support you in this, you will receive mentoring from your academic advisor pertaining to research integrity. On the Graduate School Program of Study form,

your Ethical Research Training can be documented using the following statement: “Training conducted by advisor as per the school’s assessment plan”.

Further information concerning Research Integrity and University policy can be found at the following website: `http://oregonstate.edu/research/ori/index.htm/`.

6 Master Degree Program

The School of Nuclear Science and Engineering (NSE) offers several degree programs in Nuclear Engineering, Health Physics, and Medical Physics. The School offers the following MastersâĂŹ degrees:

- Master of Science (MS);
- Master of Engineering (MEng); and
- Master of Health Physics (MHP).

The NE and HP degrees require a minimum of 45 credits to graduate; 24 credits must be graded graduate level NSE courses. Additional credits above 45 may be required depending on the educational background of the student. All students must complete a Program of Study form (see Graduate School website) before completing 18 credits. All work must be completed within seven years, including transfer credits, course work, and the thesis/oral exam.

It is the policy of the NSE Faculty that a minimum of 45 credits are required for the MS degree, of which no more than 12 blanket credits can be applied. Of these 12 blanket credits, to satisfy the minimum requirement, 6 credits (no more, no less) must be Thesis (503) and 3 credits (no more, no less) must be Seminar (507). If an additional three blanket credits are applied, those credits must be graded (not pass/fail).

Master of Science

A thesis in the major area is required for the MS degree, and the thesis format is bound by the rules of the Graduate School and the policies of the School of NSE. Visit the Graduate School's website for details. Six, and only six, of the required 45 graded credit hours must be Thesis credits.

Master of Engineering (NE only) and Masters of Health Physics (HP only)

The MEng and MHP degree options provide students the opportunity to pursue advanced-level study without the requirement of completing thesis research. A comprehensive oral exam is taken in lieu of the thesis requirement and course requirements are the same as for the MS degree. These degrees are intended as terminal degrees, not as preparation for a doctorate, and will emphasize job-related knowledge and skills. Although not required, students wishing to pursue a PhD in the future are advised to pursue an MS degree, not the MEng or MHP.

Minor (NE or RHP)

A minor field of study is optional. If a minor is declared, however, the minor requirement specified by the Graduate School is 15 hours minimum. Master's students are expected to take 18 hours or more of minor subject courses if the minor is "integrated"; i.e. it spans two or more academic units. The NSE Graduate Committee may apply suitable courses to such an integrated minor requirement as long as the courses are not in your major area of concentration and they comprise less than one-half of the credits in the minor.

It is the policy of the NSE faculty that it is acceptable for an NE student to obtain an HP minor, and vice-versa, with a minimum of 15 credits from the courses listed below, respectively.

- HP Minor: NSE 516 (4), NSE 582 (4), NSE 583 (3), NSE 588 (3), NSE 590 (3)
- NE Minor: NSE 551 (3), NSE 552 (3), NSE 553 (3), NSE 557 (2), NSE 567 (4), NSE 573 (3), NSE 568 (3)

6.1 Master's Thesis

In this document, "thesis" refers to the manuscript written for the Master's degree, while "dissertation" refers to the manuscript written for the doctoral degree. The thesis demonstrates the student's mastery of professional knowledge in a particular subject area of his/her chosen field. It must present innovative research or a novel application of a known methodology to appropriate problems. A conscientious survey of pertinent literature is a prerequisite to an acceptable thesis. The research topic must be approved by the major professor, and the research title must be registered with the Graduate School.

It is the policy of the NSE Faculty that MS students will follow the thesis formatting as stated under "Standard Document Format" in the OSU Graduate School Thesis Guide. The "Manuscript Document Format" will not be allowed for the MasterâĂŹs thesis.

Since the thesis results from a significant body of work, the student is encouraged to publish the results of the thesis in the open literature. The student cannot schedule a defense exam with the Graduate School until the major professor approves the thesis for distribution to all committee members. Once approved, the student must submit a copy of the thesis to each committee member and complete the Event Scheduling Form with the Graduate School at least two weeks prior to the intended defense date. See your major professor for any other rules regarding thesis defense preparation requirements.

An MS candidate will be subjected to a two-hour final oral comprehensive examination, which includes a thesis research presentation, defense of the research, and exam questions on major, minor, and other pertinent academic subjects.

Thesis Guide

The Graduate School's website has a complete guide to the thesis paper and the university requirements associated with the thesis. Students are encouraged to review the website listed below before starting to write the thesis to ensure understanding of the formatting, procedures, and deadlines:
`http://oregonstate.edu/dept/grad_school/thesis.php`.

6.2 Bookbinding in Corvallis

The school requires two bound copies of each thesis. Our students, including distance students, frequently use the following bookbinding company:

B & J Bookbinding
108 SW 3rd Street
Corvallis, OR 97333
Phone: 541-757-9861
Fax: 541-757-6144
E-mail: info@bjbookbinding.com
Website: `www.bjbookbinding.com`

6.3 Thesis Defense Committees (MS Students)

1. The principal authority over a student's program resides with the student's Master's Committee. This committee is responsible for:
    - assuring that University and School requirements are satisfied; and
    - administering the final oral examination.
2. The Committee consists of at least 4 members:

- the student's major professor;
- one other NSE faculty member;
- the student's minor professor, or if no minor is selected, committee member may be from graduate faculty at-large; and
- The Graduate Council Representative.

Note that the composition of a studentâĂŹs MasterâĂŹs Committee MUST be approved by the major professor.

3. The committee is originally formed, with approval from the major professor, at the student's invitation. The Graduate Council Representative is selected from a list provided by the Graduate School. The Graduate Council Representative is required to attend the final examination (thesis defense). Information on the GCR can be found at:
`http://oregonstate.edu/dept/grad_school/degreecommittee.php#council`

6.4 Non-Thesis Comprehensive Oral Exam (MEng and MHP Students)

The following guidelines are written to help the student prepare for the oral exam. In addition to these guidelines all rules of the Graduate School pertaining to final Master's oral exams must be adhered to.

1. The exam committee shall consist of the following:
   - the student's major professor;
   - one other NSE faculty member; and
   - the student's minor professor, or if no minor is selected, an additional NSE faculty member. Note: No Graduate Council Representative is required for the MHP or MEng oral exam.
2. The makeup of the exam committee must be approved by the student's major professor.
3. The exam shall be scheduled by the student, after consultation with all committee members, for a two-hour period. Scheduling shall be done in accordance with rules of the Grad School.
4. The student shall be given the option of selecting an area of concentration for the exam. The majority of exam questions will then be derived from material in that area. Exam concentration areas must be discussed with the student's major professor. The student must declare, to all committee members, his/her concentration choice at least one week prior to the exam.
5. Masters candidates who fail the oral examination on the first attempt may be given the opportunity, by the exam committee, to retake the exam or may be asked to leave the program without receiving the degree. Students are allowed to retake the exam one time only. Any student failing the second attempt will be dismissed from the program without receiving the degree.

6.5 MS/MEng In Nuclear Engineering

- At a minimum, students without an NE background shall include all courses listed below in Table 1 (or equivalent) in their program of study;
- Students who enter the program with a BS in Nuclear Engineering can, at the discretion of their major professor, eliminate NSE 515, 531, 551, 552, 567, 573, and 557 from their Program of Study; and
- The remainder of the student's major program can be a compilation from any other 500 or 600 level courses as APPROVED by the major professor. Note that at least 24 credits must be graded graduate level NSE courses.

NOTE: Term offerings may be subject to change. Consult the OSU Catalog each term.

Major Core Courses For All NE Students	Number of Credits
NSE 553 – Advanced Reactor Physics	3
NSE 535 – Radiation Shielding and External Dosimetry	4
NSE 568 – Nuclear Reactor Safety	3
NSE 536 – Advanced Instrumentation	4
NSE 507 – Seminar (three terms maximum)	3 (1 each)
Major Core Total (for all)	**17**
Additional Requirements for Students w/o an NE Background	
NSE 515 – Nuclear Rules and Regulations	2
NSE 531 – Radiophysics	3
NSE 551 – Neutronics Analysis I	3
NSE 552 – Neutronics Analysis II	3
NSE 567 – Reactor Thermal Hydraulics	4
NSE 573 – Nuclear Reactor Systems Analysis	3
NSE 557 – Advanced Nuclear Reactor Lab	2
Total Additional Requirements	**21**
Other Requirements / Electives	
NSE 503 – Thesis (MS students)	6
500 or 600 level courses (electives) as approved by major professor	varies
Other Requirements / Electives Total	**varies**
Minimum Required Credits for the Degree	**45**

Table 1: Master of Science Courses for NE Majors

6.6 MS / MHP in Radiation Health Physics

- At a minimum, the student's Program of Study shall contain the courses in Table 2 below (or equivalent);
- These courses should be taken as soon as possible in preparation for the thesis.
- The remainder of the student's major program can be a compilation of any other 500 or 600 level courses as APPROVED by the major professor. Note that at least 24 credits must be graded graduate level NE or HP courses.
- E-Campus students are required to complete laboratory work on campus; this includes NSE 536 (and possibly Radiochemistry) which are normally held early summer. Additionally, ECampus students are required to complete their final oral exam on campus.

NOTE: Term offerings may be subject to change. Consult the OSU Catalog each term.

6.7 Procedures Leading to a Master's Degree

An outline of the steps required to obtain the Master's degree is provided in Table 3. You should become familiar with the specific and detailed information contained in the Graduate School website as well as the School of NSE requirements. Final oral exams may be scheduled only during periods when classes are in session (including finals week).

Major Core Courses For All RHP Students	Number of Credits
NSE 515 – Nuclear Rules and Regulations	2
NSE 516 – Radiochemistry or NSE 519 – Radiochemical Analytical Methods	4
NSE 531 – Radiophysics	3
NSE 535 – Radiation Shielding and External Dosimetry	4
NSE 536 – Advanced Instrumentation	4
NSE 582 – Applied Radiation Safety	4
NSE 583 – Radiation Biology	3
NSE 588 – Radioecology	3
NSE 590 – Internal Dosimetry	3
NSE 507 – Seminar (three terms maximum)	3 (1 each)
Major Core Total (for all)	**34**
Other Requirements / Electives	
NSE 503 – Thesis (MS students)	6
500 or 600 level courses (electives) as approved by major professor	varies
Other Requirements / Electives Total	**varies**
Minimum Required Credits for the Degree	**45**

Table 2: Master of Science Courses for RHP Majors

Check Box	Item #	Step	Timing
	1	Choose a major professor and a general thesis topic	By the end of your second term
	2	File a Master's Program of Study form (Grad School website)	Before completing 18 credit hours
	3	Read the Thesis Guide on the Grad School's website	Prior to starting your thesis
	4	Notify your major professor of your intended graduation term	AT LEAST 1 term before your intended graduation term
	5	Compare Program of Study and transcripts for consistency	1 term before your intended graduation term
	6	File Petition to Change Program of Study, if needed.	
	7	File final Program of Study with Graduate School	15 weeks prior to final oral examination
	8	File a Diploma Application (Grad School website)	
	9	Generate Grad Council Rep (GCR) list (Grad School website) and contact those people until you find someone willing to serve as your GCR	
	10	Appoint Master's Committee w/approval of your major professor	
	11	Complete final draft of your thesis and submit it to your major professor for review and approval	By the start of your last term
	12	Decide on a day / time (2 hrs) with all Committee members (faculty & Grad Council Rep)	AT LEAST 2 weeks prior to final oral examination
	13	Reserve a room with the RC receptionist (Ecampus students need to contact the student liaison)	
	14	Fill out Exam Scheduling Form (Grad School website)	
	15	Submit thesis pretext pages to the Graduate School	
	16	Submit a final draft of the thesis to all committee members (with advisor's approval)	
	17	Confirm final oral examination appointment with the Grad School (make sure it's on their calendar!)	
	18	Email defense poster and information to Jens Odegaard (day, time, room, topic, name etc.) `jens.odegaard@oregonstate.edu`	1 week after submitting exam scheduling form
	19	Remind the Committee of the final oral examination	AT LEAST 1 week prior to final oral examination
	20	**Final oral examination**	
	21	Complete thesis revisions, have major professor approve & sign final version, and get 2 copies bound for the School `http://gradschool.oregonstate.edu/progress/thesis-guide`	Within 6 weeks of exam or by the first day of the next term, whichever is first; missing deadline will results in required registration min 3 credit no exceptions

Table 3: Procedures for MS Students

Check Box	Item #	Step	Timing
	1	Choose a major professor and a general thesis topic	By the end of your second term
	2	File a Master's Program of Study form (Grad School website)	Before completing 18 credit hours
	3	Notify your major professor of your intended graduation term	AT LEAST 1 term before your intended graduation term
	4	Choose an area of specialization within your major and notify your major professor of the area	
	5	Compare Program of Study and transcripts for consistency	1 term before your intended graduation term
	6	File Petition to Change Program of Study, if needed.	
	7	File final Program of Study with Graduate School	15 weeks prior to final oral examination
	8	File a Diploma Application (Grad School website)	
	9	Appoint Master's Committee w/approval of your major professor	
	10	Decide on a day / time (2 hrs) with all Committee members (faculty & Grad Council Rep)	AT LEAST 2 weeks prior to final oral examination
	11	Reserve a room with the RC receptionist (Ecampus students need to contact the student liaison)	
	12	Fill out Exam Scheduling Form (Grad School website)	
	13	Confirm final oral examination appointment with the Grad School (make sure it's on their calendar!)	
	14	Remind the Committee of the final oral examination	AT LEAST 1 week prior to final oral examination
	15	**Final oral examination**	

Table 4: Procedures for MEng and MHP Students

7 Doctoral Degree Program

The School of Nuclear Science and Engineering (NSE) offers Doctoral Degrees in the following programs:

- Nuclear Engineering (NE);
- Radiation Health Physics (RHP)

7.1 Course of Study

1. Requirements for the doctorate include:
   (a) at least 108 graduate credits beyond the bachelor's degree;
   (b) at least 50% of the course work must be graduate stand-alone courses;
   (c) a presentation of an original dissertation for which a minimum of 45 credit hours of dissertation research has been accumulated;
   (d) a minimum of one year of residence, continuously, at OSU (i.e., three consecutive terms as a full-time student);
   (e) passing a preliminary oral examination in the major subject; and
   (f) successfully defending the dissertation.

   For other regulations, see the OSU Catalog, Graduate School website and School of NSE policies.
2. In addition, School requirements include:
   (a) passing a written qualifying examination for candidacy;
   (b) on assignment from the student's doctoral committee, taking and passing (B average or higher) such courses as judged desirable by the doctoral committee for satisfactory progress in doctoral research;
   (c) calling regular (every 6 months recommended, but at least annual) meetings of the Doctoral Committee so that the student's progress can be evaluated and guidance offered; and
   (d) preparing, presenting and defending a written dissertation proposal, i.e., the Preliminary Exam. Confer with your major professor to prepare for this exam. The Prelim Exam should be taken as soon after the qualifying exam as possible.
3. As noted above, the studentâĂŹs principal direction in the course of study comes from the doctoral committee, in which the major professor has final approval. The NSE members on the doctoral committee will expect to see:
   (a) a minimum of 45 dissertation credits (NSE 603); and
   (b) total non-thesis coursework of 63 hours or more, (excluding thesis). The minimum Graduate School requirement is 108 hours, including thesis.

7.2 Doctoral Committees

1. The principal authority over a student's program resides with the student's Doctoral Committee. This committee is responsible for:
   - assuring that University and School requirements are satisfied;
   - monitoring student progress;
   - assigning and approving courses of study;

- approving dissertation topics and paths-forward; and
- administering preliminary and final oral examinations.

2. The committee must include at least 5 members:

   - the student's major professor;
   - two other NSE faculty members;
   - the student's minor professor, or if no minor is selected, committee member may be selected from the graduate faculty at-large; and
   - one Graduate Council Representative.

   A student's Doctoral Committee may contain more than 5 members. Any additional members beyond the required 5 must be chosen from the Approved Graduate Faculty List for NSE maintained by the OSU Graduate School.

   Note that the composition of a student's Doctoral Committee MUST be approved by the major professor.

3. The committee is originally formed, with approval from the major professor, at the student's invitation. The Graduate Council Representative is selected from a list provided by the Graduate School. The Graduate Council Representative is a permanent member of the committee and attends all committee meetings, including the preliminary program committee meeting, the oral preliminary exam, and the final examination (dissertation defense). Information on the GCR can be found at: `http://oregonstate.edu/dept/grad_school/degreecommittee.php#council`

4. The Committee must be appointed prior to the PhD Program Meeting.

7.3 Matriculation/Candidacy

1. Matriculation (first term of attendance) qualifies the student to:

   (a) select a general area of dissertation research;

   (b) form a doctoral committee with the major professor's guidance and approval; and

   (c) hold the initial doctoral Program Meeting.

2. After matriculation, the student must pass a written qualifying examination (described below). This examination must be taken before the end of the first 18 months as a PhD student.

7.4 Written Qualifying Examinations for Doctoral Students

1. A written exam ("the qualifier") is required of all PhD students. Upon completing the program meeting and passing the exam, the student is categorized as a PhD "candidate." An overall grade of 80% is required to pass the exam (see #6 below for more details).

2. The examination is offered once each year in the Fall. Additional or alternate examination periods may be scheduled at the discretion of the NSE Graduate Committee.

3. The examination will be supervised and evaluated by an examination committee chosen from the NSE graduate faculty. The Graduate Program Chair will coordinate the examination.

4. All students entering the doctoral program are required to take the qualifying examination within 18 months of matriculation as a PhD student. Typically, those students entering without a Master's degree will take the examination in the Fall term of their second year. Students continuing for the PhD after receiving a Master's degree in a related area generally will take the qualifying exam the next time it is offered after matriculation.

5. The examination will require two working days and will be divided into three subject areas with weights toward the total score as indicated:

   (a) Basic Nuclear Interactions (35%), this section is common to all degrees and consisting of one, three-hour, closed-book written examination covering material typical to undergraduate degrees and/or graduate courses in nuclear interaction physics, etc. NSE graduate courses covered in this part of the exam include:

   NSE 531 – Radiophysics
   NSE 536 – Advanced Radiation Detection and Measurement

   (b) Core Nuclear Engineering and Health Physics (40%), consisting of one, three hour, closed-book written examination covering material typically found in the set of identified âĂIJcoreâĂİ graduate courses in NE and RHP. NSE graduate courses covered in this part of the exam include:

   Nuclear Engineering Core Courses
   NSE 551/552/553 – Neutronic Analysis & Laboratory
   NSE 567 – Advanced Nuclear Reactor Thermal Hydraulics
   NSE 573 – Nuclear Reactor Systems Analysis

   Radiation Health Physics Core Courses
   NSE 535 – Radiation Shielding and External Dosimetry
   NSE 582 – Applied Radiation Safety
   NSE 583 – Radiation Biology
   NSE 588 – Radioecology
   NSE 590 – Internal Dosimetry

   (c) Nuclear Engineering, Radiation Health Physics Selected Topics (25%), consisting of one three-hour, closed-book written examination in specialized topics within each studentâĂŹs approved graduate program of study. Student choice of topics will be solicited, but must be approved by the examination committee.

6. The student passes the Qualifying Exam with a total score of at least 80% and partial scores (in each of the three subject areas described in No. 5 above) of at least 70%. A student earning a total score between 70% and 80% or any partial score between 60% and 70%, shall stand for an oral examination by a committee of three faculty, appointed by the NSE Graduate Committee. This oral examination shall take place within two weeks following student notification of any deficiency. Following this oral examination, the three-member committee will report the results to the NSE Graduate Committee where a decision will be made as to whether or not the student has passed the qualifier.

7. Prospective doctoral candidates failing the qualifying exam may retake the test the next time it is offered, and then only with the following privileges and exceptions:

   (a) The student may retake the exam only once.

   (b) If the student's total score on the first exam is over 60%, re-examination need only be taken on those portions of the test (e.g. Basic Nuclear Interactions, Core, or individually selected topics) for which he/she received partial scores below 70%. The original scores above 70% will be considered when calculating the re-examination score. The recalculated total score must be greater than 80%.

8. Prospective doctoral candidates whose total grade falls below 60% on their first examination, may be dismissed from the program, or may at the discretion of the NSE Graduate Committee, be given the opportunity to retake the entire exam.

9. Students should begin preparing for and complete the oral preliminary exam as soon after having passed the qualifying exam as possible.

7.5 Preliminary Oral Examination

PhD candidates will present their proposed dissertation research as part of their Preliminary Examination. This formal seminar is to be a presentation of their planned research and a review of the literature supporting this plan. In preparation for the Preliminary Examination, the student will prepare a written dissertation proposal and present this written proposal to their doctoral committee at least two weeks prior to the exam. This proposal will include a thorough literature review, an outline of the proposed research project, and a description of the importance of the research with a perspective on the current state of the area of specialty.

As a means for giving the student's committee an early chance to help direct the doctoral research, the preliminary examination will start with the student presenting their written dissertation proposal and their proposed research direction. This will be a 30 minute (or amount of time determined by the major professor) presentation by the student on his/her proposed research. The committee will then discuss this research proposal with the student. The discussion is meant to identify strengths and weaknesses within the student's preparation and proposal. It is intended to be a constructive critique of the progress achieved to date, as well as to provide focus for the student's research. The oral preliminary examination will be scheduled for a minimum of two hours.

The remaining portion of the examination will focus on the student's basic understanding of Nuclear Engineering or Health Physics (as covered in the qualifying examination) and the minor area(s), as well as all of the courses that the student has taken at OSU.

At least one complete academic term must elapse between the time of the preliminary oral examination and the final oral examination. If more than five years elapse between these two examinations, the candidate will be required to take another Preliminary Examination.

7.6 Doctoral Dissertation

The dissertation should be a significant research contribution publishable in a recognized professional journal and should demonstrate the student's competence in conducting fundamental research. It must represent a significant contribution to the existing body of knowledge in Nuclear Engineering or Health Physics. The research topic must be approved by the student's Graduate Committee and the dissertation title must be approved by the Graduate School. The dissertation must be based on the candidate's own investigation, show a mastery of the literature of the subject, and be written in credible literary form. In order to have the efforts of the student recognized outside of OSU, the student must, in addition to dissertation requirements, prepare a paper which is suitable for submission to a recognized, scientific peer-reviewed journal. A final draft of the dissertation must be presented to the student's doctoral committee at least two weeks prior to the final oral examination. A thesis guide is available at the Graduate School website:
`http://oregonstate.edu/dept/grad_school/thesis.php`.

Options for the binding of the dissertation are discussed in Chapter 6.2 of this document.

7.7 Final Oral Examinations

The dissertation defense will be scheduled for two hours. The student is expected to defend his/her dissertation research and display a mastery of knowledge in his/her chosen field.

7.8 Procedures Leading to the Doctoral Degree

Below is a brief list of the steps required to obtain the PhD degree. The student should also become familiar with the specific and detailed information contained in the OSU Catalog and the Graduate School website, as well as NSE requirements. Program meetings, preliminary oral exams, and final oral exams may be scheduled only during periods when classes are in session (including finals week).

Check Box	Item #	Step	Timing
	1	Generate Grad Council Rep (GCR) list (Grad School website) and contact those people until you find someone willing to serve as your GCR	During first term
	2	Form Doctoral Committee in consultation with major professor	
	3	Schedule doctoral program meeting with all committee members; reserve a RC room w/the RC receptionist	Before completing 18 hours
	4	Doctoral program meeting	
	5	File Doctoral Program of Study	
	6	Take written qualifying exam; a notice will be sent regarding the exam days/times. Upon passing, the student becomes a PhD "Candidate"	Prior to 18 months after matriculation
	7	Schedule the preliminary oral examination w/your committee	AT LEAST 2 weeks prior to preliminary oral examination
	8	Reserve a room in the RC w/the receptionist for the preliminary oral examination	
	9	Pick up copies of final oral examination scoring guide from student liaison	
	10	Fill out Exam Scheduling Form (Grad School website)	
	11	Submit written dissertation research proposal to the entire Committee (with advisor's approval)	
	12	Preliminary oral examination	NO LATER THAN 6 months after passing qualifying exam
	13	Hold regular meetings with your Committee to keep them updated on your progress	Throughout your degree progression (at least once a year)
	14	Read the Thesis Guide on the Grad School's website	Prior to starting your dissertation
	15	Compare Doctoral Program of Study form and transcripts for consistency	1 term before your intended graduation term
	16	File Petition to Change Program form if needed	
	17	File a Diploma Application (Grad School website)	15 weeks prior to final oral examination
	18	Complete final draft of your dissertation and submit it to your major professor for review and approval	By the start of your last term
	19	Schedule the final oral examination w/your committee	AT LEAST 2 weeks prior to final oral examination
	20	Reserve a room with the RC receptionist	
	21	Fill out Exam Scheduling Form (Grad School website)	
	22	Submit thesis pretext pages to the Graduate School	
	23	Submit a final draft dissertation to all committee members (with advisor's approval)	

Check Box	Item #	Step	Timing
	24	Confirm final oral examination appointment with the Grad School (make sure it's on their calendar!)	1 week after submitting exam scheduling form
	25	Email defense poster and information to Jens Odegaard (day, time, room, topic, name etc.) jens.odegaard@oregonstate.edu	AT LEAST 1 week prior to final oral examination
	26	Remind Committee of the final oral examination	2 days prior to final oral examination
	27	Final oral examination	NO EARLIER THAN 1 term after passing preliminary oral examination
	28	Complete dissertation revisions, have major professor approve & sign final version, and get 2 copies bound for the Department	Within 6 wks of the defense or by the first day of the next term, whichever is first; a missed deadline will require you to register for an additional 3 credits, no exceptions!
	29	Submit final copies (Grad School)	

Table 5: Procedures for PhD Students

7.9 Notes About the Checksheet

The Doctoral Program of Study form is located on the Graduate School's website. You should work with your major professor to fill out the Program of Study form, because your committee needs to approve the Program of Study before you can submit it to the Graduate School.

The Written Qualifying exam is normally offered only in the Fall term. Students who need to take the exam are notified of the exam dates near the beginning of the Fall term. Upon passing the exam, the student becomes a PhD "Candidate."

For various reasons, changes often occur with the classes you plan to take and what you actually end up taking to earn your degree. When you graduate, the Program of Study must be 100% accurate. You should compare the program on file with your transcripts, which can be viewed by logging into Student Online Services. Make corrections by filling out the Petition to Change the Program of Study form at least one term before you plan to defend. You do not have to fill it out each time you deviate from your original program; however, you need to keep your committee informed of any and all changes since they are the ones who must approve your final Program.

Give yourself and your committee members a lot of time to plan for the defense date. Sometimes committee members will be on sabbatical leave during the term in which you plan to defend. You should check with your committee members about such leaves far in advance to better plan, especially if you need to change a committee member for any reason.

The Diploma Application must be filed no later than week two of the term in which you defend. However, it is okay to fill out the form a term or two early. If you need to change your end term after you fill out the Diploma Application, just fill out the application again.

When you confirm your defense exam date with the Graduate School, you are essentially placing your exam on their calendar. If they are not aware of your defense date, even if you filled out all the paperwork, you will not be able to defend and will have to reschedule.

The Graduate School has a Thesis Guide on their website, which explains the specific criteria for library copies of the dissertation. Students are encouraged to review the site, listed below, before starting to write the thesis to ensure understanding of the formatting, procedures, and deadlines:
`http://oregonstate.edu/dept/grad_school/thesis.php`