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Welcome to Oregon State University and the Department of Nuclear Engineering and Radiation Health Physics (NERHP). This handbook is intended to help you get settled and answer some of the questions you might have as a new graduate student in our department. 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 Department are available and willing to help solve problems. Additional information on deadlines, procedures and requirements is provided by the current Oregon State University Graduate School Bulletin and Survival Booklet which may be obtained from the Graduate School: [http://oregonstate.edu/dept/grad_school/](http://oregonstate.edu/dept/grad_school/).

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

The program requirements that an NERHP student must satisfy for the degree are those contained in the version of the handbook and/or Graduate Catalog that is current at the time of your matriculation in the department. The student and thesis 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 field.

Dr. David M. Hamby, Professor and Graduate Committee Chair
Department of Nuclear Engineering and Radiation Health Physics

**FACULTY & STAFF CONTACTS**

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<td>Dr. Kathryn Higley</td>
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<td>Dr. David Hamby</td>
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<td>Joan Stueve</td>
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<td>Student Liaison</td>
<td>Kristie Marsh</td>
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<td>RC Director</td>
<td>Dr. Steve Reese</td>
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GETTING SETTLED

The Department of Nuclear Engineering and Radiation Health Physics (NERHP) 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.

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 a.m. – 5 p.m., 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 5 p.m. – 8 a.m. 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.

GRADUATE STUDENT OFFICES

NERHP graduate student offices are located throughout the RC. Offices are assigned as students arrive on campus. There are limitations to space. Students on graduate research or graduate teaching assistant appointments will be given preference, with remaining students placed as space permits. For office assignments, see the Graduate Committee Chair listed in the Welcome section of this book. Once placed, please do not change your office space without the Graduate Committee Chair’s approval.

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 a.m. and 2:30 p.m. 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.
ADVISOR / MAJOR PROFESSOR
The Departmental Graduate Committee Chairperson 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.

TELEPHONES

Telephone Directory
The RC Telephone Directory is revised annually and lists personnel located in the RC. A directory will be placed in your mailbox when updated.

Long Distance Calls
An authorization code is required to make long distance telephone calls. You will be given a code by your major professor if you are expected to make such calls as part of your research work. The authorization code is unique and intended for use by the person to which it is assigned.

Authorization codes must be kept secure and not given to other persons. Codes must not be used for personal calls or purposes other than those intended. Directions on how to make and charge personal calls are provided on the back page of the OSU telephone directory.

XEROX, OFFICE SUPPLIES, & SCANNER
The RC provides a copier and scanner in B134. Anyone desiring to make personal copies may purchase a personal copier code from the Business Manager in A102. It is important that the cleanliness of the copy room be maintained; please do your part.

Copies for class or official use must be approved by a faculty member, but generally the class TA will make copies for class use.
Office supplies are for the use of staff members only. A stapler and hole-punch are available in the copy room (B134) for student use.

VENDING MACHINE
There is a Pepsi machine located across from B124 between B and D corridors. The student group, Alpha Nu Sigma, has snacks for sale in the RC receptionist’s office.
COMPUTER USE

In general, most of the large computer codes used in the Department 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.

Departmental computers are supplied to allow you to perform your research activities and coursework, and should not be used for games or other personal uses during normal business hours (8:00 a.m. - 5:00 p.m., 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.

The undergraduate computer room (A124) is reserved primarily for undergraduate student use for class and project work. Occasional, short-term use 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 Department’s computer hard disks without approval from the Department 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 Department’s machines without permission exposes the Department 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 Department’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:// engr.oregonstate.edu/computing/

PARKING

Except in the open or pay lots, all motor vehicles parked on campus from 7 a.m. to 5 p.m., Monday through Friday, must display a valid parking permit. A student permit entitles you to park in Student parking areas (designated by a green sign), anytime.

The RC parking lot is divided into two well-marked areas. The south area is for Staff parking and the north area is for Students and Visitors. For more information contact Parking Services at 737-2583 or see their web site at: http://oregonstate.edu/facilities/transit_pkg/index_pkg.html.

SMOKING POLICY

Smoking or carrying any lighted device is prohibited within enclosed university facilities. Smoking will only be allowed on campus in specifically designated areas where "second-hand" smoke cannot affect others. Smoking is not allowed anywhere in the RC.
**RC 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** reshel all materials you use but rather put your books in the designated area with the sign that reads “Please return materials here.” The RC receptionist will reshel materials to their proper places. 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.

**GENERAL RC 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 “over night” in the building.

The last person to leave a room after 5:00 p.m. must 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.

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**SPECIAL SERVICES AT OSU**

**CAMPUS RESOURCE GUIDE**
The campus resource guide is a list of services available to students and faculty. For details, please visit [http://oregonstate.edu/dept/grad_school/resourceguide.php](http://oregonstate.edu/dept/grad_school/resourceguide.php).

**OSU STUDENT BRANCH – AMERICAN NUCLEAR SOCIETY (ANS)**
OSU has a very active student branch of the American Nuclear Society (ANS). Officers are elected once each year. Contact the Faculty Advisor for information on the student chapter of the ANS.

National ANS student member dues are currently $15.00 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 one ANS professional division or technical group
- Various honors and awards

Local ANS Student Branch dues are $5.00. This money is used to support the activities of the OSU Student Branch, including membership drives, annual picnics, high school outreach and participation in national ANS activities. The application form is available online at http://ans.org/.

**OSU STUDENT BRANCH – HEALTH PHYSICS SOCIETY (HPS)**

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 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 RHP and NE programs, as well as students with an interest in health physics. For a membership application contact the website at http://hps.org.

**FACULTY**

Stephen E. Binney

Abi T. Farsoni

David M. Hamby

Jack F. Higginbotham
Professor, Director, Oregon Space Grant, Faculty Liaison, Research Office. B.S. Nuclear Engineering (1981), M.S. Nuclear Engineering (1983), Ph.D. Nuclear Engineering (1987), Kansas State University. Fields of interest: radiation shielding, radiation protection, activation analysis, radiation detection, nuclear instrumentation. Associate Director, Oregon Space Grant (2000-2002); Associate Dean, OSU Graduate School (1998-2000); Reactor Administrator (1994-1998), Senior Health Physicist (1987-94), OSU Radiation Center; Supervisor, Kansas State University research reactor; Black and Veatch Consulting Engineers (DATE?). Consultant to U.S. National Aeronautics and Space Administration; U.S. Department of Energy; U.S. Geological Survey; University of Texas at Austin; University of Utah; University of Nevada; Las Vegas; Oregon Health Sciences University; Hewlett Packard; Battelle-Pacific Northwest Laboratories; Oregon Department of Energy. Member, Health Physics Society, American Nuclear Society. Professional Progress Award, Kansas State University; Elda Anderson Award, Health Physics Society (1997); Loyd Carter Award (1997) OSU College of Engineering Teaching Award; Academic Dean, Health Physics Society Summer School; Chair, Part II Panel, American Academy of Health Physics; President, Cascade Chapter, Health Physics Society. Registered Professional Engineer (Nuclear). Certified Health Physicist. At Oregon State University since 1987.

Kathryn A. Higley
Head, Department of Nuclear Engineering and Radiation Health Physics; Professor. B.A. Chemistry (1978), Reed College; M.S. Radiological Health Sciences (1992), Ph.D. Radiological Health Sciences (1994), Colorado State University. Fields of interest: human and ecological risk assessment, environmental pathway analysis, environmental radiation monitoring, radionuclide and hazardous chemical transport, radiochemistry, neutron activation analysis, nuclear

Andrew C. Klein


Camille J. Lodwick


Todd S. Palmer


Alena Paulenova  

Steven R. Reese  

José N. Reyes, Jr. (currently on assignment at NuScale Power Inc.)  

John C. Ringle  
Brian Woods


Qiao Wu


CURRENT RESEARCH

Current areas of research interest in Nuclear Engineering are oriented toward advanced power reactor development, thermal hydraulics, numerical methods and analysis and neutron scattering. Specific areas include nuclear reactor engineering, experimental and thermal hydraulics, nuclear power generation, reactor physics, nuclear criticality safety, radiation transport computational methods development, nuclear waste management, in-core fuel management, nuclear instrumentation, radioisotope production, radiation shielding, space nuclear power, research reactor utilization and development, medical physics, and materials investigations using neutron beams.

Areas of research interest in Radiation Health Physics include environmental health physics, radioactive material transport, research reactor health physics, radiation detection methods, instrumentation development, radiation shielding, environmental monitoring and assessment, radiation dosimetry, emergency response planning, and high-and low-level waste management. Faculty research evolves over time and is generally dictated by the availability of funding. Current research in the Department of Nuclear Engineering and Radiation Health Physics covers a wide range of topics including:

Nuclear Reactor Thermal Hydraulics: A wide variety of nuclear reactor thermal hydraulics problems have been investigated at Oregon State University. These include the development of a library of best estimate thermal hydraulic computer codes for nuclear reactor safety analysis, experimental studies of the mixing of reactor fluids in reactor relevant geometries, experimental studies to characterize a variety of two-phase flow patterns, the analysis of countercurrent
flooding behavior in reactor geometries, the analysis of condensation induced water hammers, and a study of the effects of fluid particle interactions on interfacial transfer and flow structure. (see Dr. Wu)

**Advanced Plant Experiment**: The Department of Nuclear Engineering and Radiation Health Physics has constructed a 1/4 scale test facility to assess the performance of the new passive safety systems incorporated into Westinghouse’s next generation of nuclear power plant, the AP1000. The test facility includes all of the design features of the actual AP1000 with the exception that electric heater rods, rather than nuclear fuel, are used to generate core heat. The OSU AP1000 is capable of continuous operation at 600 kW and includes over 600 scientific instruments for data collection. A state-of-the-art control system and data acquisition system are used to control, monitor and record the performance of the various gravity driven safety systems. Engineers from the US Nuclear Regulatory Commission, the US Department of Energy, Westinghouse, the Idaho National Engineering and Environmental Laboratory, and the Electric Power Research Institute have been on site at the Radiation Center during different phases of testing. OSU nuclear engineering researchers have also participated in designing tests performed in Italy and Japan. The OSU tests are the only AP1000 integral system tests to be performed in the United States. (see Dr. Woods)

**Skin Dosimetry**: A team of faculty and students are currently revising the dosimetry models for the VARSKIN computer code. VARSKIN is maintained by the Nuclear Regulatory Commission; a research contract was recently awarded to the Department to modify and improve the photon and beta dosimetry models for estimating the dose to skin as function of penetration depth. The software infrastructure is also being updated to incorporate a more appropriate program language and easier to use graphical user interfaces. (see Dr. Hamby)

**Multi-Application Small Light Water Reactor (MASLWR) Test Facility**: The Department has constructed a test facility to test the performance of the “Multi-Application Small Light Water” (MASLWR). MASLWR is a next generation nuclear power plant that is being examined for future commercial employment. The Test Facility is constructed of all stainless steel components and is capable of operation at full system pressure (1500 psia), and full system temperature (600F). All components are 1/3 scale height and 1/254.7 volume scale. The current testing program is examining methods for natural circulation startup, helical steam generator heat transfer performance, and a wide range of design basis, and beyond design basis, accident conditions. In addition, the MASLWR Test Facility is currently the focus of an international collaborative standard problem exploring the operation and safety of advanced natural circulations reactor concepts. Over 7 international organizations are involved in this standard problem at OSU. (see Dr. Woods)

**Nuclear Reactor Systems Design**: This area examines the overall design features of existing and advanced nuclear power generation systems, including the examination of light water reactor nuclear fuel, core cooling systems, main steam systems, power generation equipment, process instrumentation, containment, and active and passive engineered safety features. General studies of the neutronics of nuclear reactors include the theory of steady state and transient behavior of nuclear reactors, including reactivity effects of control rods and fuel, determination of nuclear reaction cross sections, and steady state and transient reactor behavior. Thermal hydraulic studies related to nuclear reactor design include hydrodynamics, conductive, convective and radiative heat transfer in nuclear reactor systems, core heat removal design, and single and two-phase flow behavior. Nuclear criticality safety studies include design and neutronic analysis of storage and transportation facilities for spent fuel and weapons materials. (see Dr. Woods)
**Very High Temperature Reactor (VHTR) System Design:** The Very High Temperature Reactor is a helium cooled nuclear reactor operating at an outlet temperature of 1000°C. This design has been selected as the lead US design for the Next Generation Nuclear Plant. OSU has been tasked by the US Nuclear Regulatory Commission with the development, design and testing of a reduced scale model of the VHTR reference design (both a prismatic and a pebble bed version). It is envisioned that this test facility will be used to obtain high quality data on thermal fluid behavior in the VHTR for the areas that have been identified as challenges to the VHTR design. Design and development activities for the test facility are underway with construction set to begin in 2009. (see Dr. Woods)

**Numerical Methods:** Ongoing research projects include reactor simulations for antineutrino source characterization, radiation transport through stochastic mixtures, analysis of curvilinear geometry characteristic transport methods, and the use of deterministic transport algorithms in radiation detection and medical physics simulations. Other research areas encompass the development of improved iterative techniques and discretizations for unstructured mesh transport and diffusion, and parallel algorithms for particle transport. (see Dr. Palmer)

**Research Reactor Operations and Management:** Research reactor management in a highly regulated environment with a limited budget presents many challenges, yet the OSU TRIGA reactor (OSTR) has been widely recognized as a national leader in professionalism and quality. The OSU Department of Nuclear Engineering and Radiation Health Physics is one of only a few programs in the country with onsite access to an operating research reactor. Students are encouraged to be involved in reactor operations. OSU is also currently working on the experimental quantification of the thermal-hydraulic behavior of low enriched uranium (LEU) based fuels for use in high performance research reactors. (see Dr. Reese)

**Radiation Instrumentation Development:** A number of research projects involving the development of radiation detectors and digital readout electronics are ongoing. These projects include the development of beta/gamma coincidence spectrometers for measuring the concentration of xenon radioisotopes in the atmosphere to monitor atmospheric or underground nuclear weapons tests. We are also designing our customized digital pulse processor systems. Comparing with traditional analog pulse processors, digital systems bring several benefits to our experiments; they are more accurate, inexpensive, compact, and more flexible. (see Dr. Farsoni)

**Therapeutic Medical Physics:** Therapeutic medical physics is characterized as the clinical application of radiation to treat cancer. Research is comprised of issues related to generating and delivering radiation to the patient, as well as determining the corresponding radiation dose and biologic tissue response. Research is conducted to improve the precision and accuracy of both brachytherapy (sealed source) and external beam treatment modalities in order to optimize damage to the tumor volume while reducing doses to critical organs. Specific projects include the advancement of dosimetry for radiation treatment planning for both Monte-Carlo and deterministic calculations, development of ultra low-powered wireless in-vivo dosimeters for treatment verification, and assessment of accuracy associated with 4D respiratory gating techniques. Overall, this continually changing field presents exciting, interdisciplinary opportunities in radiation physics, medicine, and other specialties of science and engineering. (see Dr. Lodwick)

**Radiochemistry:** Applying nuclear methods to study environmental and biomedical problems, such as speciation and mobility of radionuclides in natural bio-geochemical systems, complexation of the actinides and lanthanides with organic ligands for use in medical imaging and radiotherapy, including radioanalytical and separation processes (radiochemical sensors, waste treatment, decontamination, depositories, barriers). (see Dr. Paulenova)
Uncertainties in Environmental Dose Assessments: A number of areas of environmental dosimetry are being examined using Monte Carlo methods to assess their contribution to dose estimate uncertainties and to determine the most sensitive parameters in environmental dosimetry models. Estimates are then integrated to evaluate our overall understanding of dose estimates to members of the general public resulting from releases of radioactive materials from nuclear facilities. (see Dr. Hamby)

The Use of Uncertainty in Decision-Making: A recent grant for the Defense Threat Reduction Agency (DTRA) is allowing researchers in Health Physics to work with the OSU Department of Psychology on a study of how decision-makers utilize uncertainty information in making their decisions. The study focuses on nuclear events and the use of resources, risk assessment, and uncertainty to track and determine the best means of presenting graphical uncertainty products to those charged with incident command following a nuclear release. (see Dr. Hamby)

Hanford-Related Issues: A number of issues relating to the Hanford Nuclear Reservation are of interest to Oregonians and Oregon state agencies. Those currently under investigation include the transport of radioactive material into and out of the site, and off-site releases of radioactive material via pathways which could impact Oregon. Such pathways include groundwater to the Columbia River and incidents involving airborne releases. (see Dr. Higley)

Radioecological Benchmarks: Recent changes in regulations regarding cleanup of radioactive and hazardous waste sites have focused attention on the impact to non-human biota. Staff are investigating methods to adapt existing environmental contaminant transport models to evaluate impacts of cleanup on ecosystems. (see Dr. Higley)

Neutron Radiography: Research into the application of radiographic techniques as tools for evaluating in situ contaminant distribution has recently been initiated. (see Dr. Reese)

Emergency Response: Work is being conducted in atmospheric modeling, environmental sampling, and pathway analysis for emergency management support with the state of Oregon. A sophisticated transport model is utilized for hazard assessment and models are being developed for remediation management. (see Dr. Higley)

Facilities
The Department of Nuclear Engineering and Radiation Health Physics 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 in two on-site computer laboratories. The department's computers also provide access through networking to larger computers, such as supercomputing facilities, on and off campus.

The department is housed in the Radiation Center, an instructional and research facility established specifically to accommodate research programs involving nuclear science and engineering, 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.

In addition to the radiation facilities, there are laboratories dedicated to the investigation of
thermal hydraulic and heat transfer phenomena. Included is the OSU/AP1000 Integral System Test Facility, a complete one-quarter scale model of the Westinghouse AP1000 Advanced Pressurized Water Reactor design. OSU tests to assess the performance of new passive safety systems incorporated into this next generation nuclear power plant are the only AP1000 integral system tests to be performed in the U.S. Other laboratories are dedicated to understanding basic heat transfer phenomena related to two-phase flow and boiling phenomena, generic reactor system interactions, and fabric composite thermal radiators for space applications. A new building is also under construction to expand the current thermal hydraulic research capabilities.

Research Facilities at a Glance

1. **1.1 MW TRIGA Mark II Pulsing Research Reactor** - 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. We are one of only 21 universities to have a reactor.

2. **ATHRL - Advanced Thermal Hydraulic Research Facilities**. Incorporates three facilities: 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), Air-water Test Loop for Advanced Thermal-hydraulic Studies (ATLAS), and Multi-Application Small Light Water Reactor (MASLWR), 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.

3. **ANSEL - The Advanced Nuclear Systems Engineering Laboratory** is the home to two major thermal-hydraulic 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 thermo-mechanical 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. **Other Labs and Facilities**: Radiochemical Analytical Laboratory with radio-HPLC- and radio-LC-IS-MS/MS systems; Cobalt-60 Gamma Irradiator; Neutron Radiography Facilities; Gamma and Alpha Spectrometry Facilities; Radiological Instrument Calibration Facilities; Liquid Scintillation Counting Systems; Thermoluminescent Dosimetry Systems; large inventory of radiation detection instrumentation; student computer laboratory; student nuclear instrumentation laboratory; and wet chemistry laboratories.
ACADEMICS

GENERAL INFORMATION
Graduate students are expected to read the academic policies governing graduate students listed on university websites, which include but are not limited to the Graduate Catalog on the Graduate School’s website and the Student Conduct Regulations. The information herein addresses only a few topics regarding the policies.

ACADEMIC PERFORMANCE

GPA. 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 the overall cumulative program at Oregon State University. 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.

A GPA of 3.00 (a “B” average) is required: (1) for all courses taken as a degree seeking graduate student, and (2) for courses included in the graduate degree or graduate certificate program of study. Grades below "C" (2.00) cannot be used on a graduate program of study. A GPA of 3.00 is required before the final oral or written exam may be undertaken.

Course Load. See the Registration section below for specific registration rules, including full-time, half-time, and assistantship enrollment requirements.

GRADUATE ASSISTANTSHIPS
Graduate research or teaching assistants may be appointed on an academic-year (9-month) basis or a full-year (12-month) basis. No appointment can be for less than 0.20 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 may be 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 9 credit hours.

Additionally, students who hold multiple jobs 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.

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
  o Any Summer term in which a student enrolls.
  o 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. Part-time students will need to fill out a form with Financial Aid, informing OSU that enrollment is part-time instead of full-time.

**Maximum Registration Requirements**

- Grad students can register for a maximum of 16 credits a 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 the Grad School to register beyond 16 credits.

**Full-Time and Part-Time Enrollment**

- Full-time status is an enrollment of 9 credits per term (including Summer).
- Part-time status is an enrollment of 5 credits per term.
  - Financial Aid for part-time graduate students is evaluated on the basis of their part-time enrollment; students need to contact Financial Aid for specific requirements.

**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](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.

**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 department secretary 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 AND make up 3 credits for each term you missed 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 Graduate Catalog under “Policies Governing All Graduate Programs” and “Registration Requirements” [http://catalog.oregonstate.edu/Default.aspx?section=Graduate](http://catalog.oregonstate.edu/Default.aspx?section=Graduate)
  - Contact the OSU Graduate School at 541-737-4881.
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 9 credits (full-time enrollment).

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

BASIC REQUIREMENTS FOR ALL GRADUATE DEGREES

**Department Seminar:** All graduate students are expected to take a departmental seminar course (NE/RHP/MP 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 Department, or by the student’s advisory committee as needed to strengthen his or her background.

**Graduate Minor:** OSU does not require graduate students in engineering to pursue a minor. However, if desired, a minor may be selected. The minor may be a recognized department minor, a recognized integrated minor, or a student-designed/committee-approved minor. Speak with your major professor for more details on minors.

**Program of Study:** All students are required to complete a Program of Study outlining the courses they will take to complete their degree requirements; it’s a contract between the student, the department, and the university (the Graduate School). Students must consult and receive approval (signature) from the individual major professor prior to submitting the form to the department staff, who will photocopy the signed Program and send the original to the Grad School (see Sections: Master’s Program and Doctoral Program). The Program form must be completed 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 Catalog for further details. http://oregonstate.edu/dept/grad_school/current/forms.html

QUARTERLY REPORTING

The department requires quarterly written reports from graduate students. The primary purpose of this reporting requirement is to ensure that all students are making timely progress toward their degree. This provides an excellent opportunity for identifying potential problems and beginning the correction process. These reports will be due in the NERHP office on the second Friday of each term, excluding Summer term.

This typewritten report should be no more than two pages long and must be signed by your major professor. It will become part of your Departmental file. The report should detail the progress on your course work and research, your progress in meeting Graduate School requirements, your plans for the next reporting period, and your expected date of degree completion.

The Student Liaison will e-mail you a copy of the Quarterly Report form. You may wish to keep an electronic copy of the form for future terms – updating the form is easier than recreating it.
MASTER DEGREE PROGRAM

The Nuclear Engineering and Radiation Health Physics Department (NE/RHP) is made up of three programs: Nuclear Engineering, Radiation Health Physics, and Medical Physics. The NE/RHP department offers the following types of Masters degrees:

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

The NE and RHP degree options require a minimum of 45 credits to graduate; 24 credits must be graded graduate level NE or RHP courses. Medical Physics degree options require a minimum of 51 credits to graduate; 39 credits must be didactic classroom and laboratory instruction, as well as full-time clinical practicum. 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.

In addition to the formal requirements listed in the Graduate School Catalog (http://catalog.oregonstate.edu/), the NE/RHP Department has policies listed below with regard to the course of study for each Master’s degree.

As with all policy matters, students have the right to petition for deviation from departmental policies to the NERHP Department Graduate Committee. Such petitions must be made in writing, indicating the policy deviation requested and the reason(s) for the request. The decisions of the Department Graduate Committee are final.

Masters of Science (NE, RHP, or MP)
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. Visit the Graduate School’s website for details. Six of the required 45 graded credit hours must be Thesis credits; Ecampus MS students must register for on campus Thesis as an Ecampus version of the course does not exist at this time.

Masters of Engineering (NE only) and Masters of Health Physics (RHP only)
The MEng and MHP degree options provide students the opportunity to pursue advanced-level study without the requirement for a research thesis. 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 one day are advised to pursue an MS degree, not the MEng or MHP.

Minor Option (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 departments. The NE/RHP Departmental Graduate Committee may apply suitable NE courses to such an integrated minor requirement as long as the NE courses are not in your major area of concentration and they comprise less than one-half of the credits in the minor.
MASTER’S THESIS
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.

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 final draft of the thesis. 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 oral comprehensive examination, which includes a thesis research presentation and defense and 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 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

BOOKBINDING SERVICES IN CORVALLIS
The department 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
Website: www.bjbookbinding.com
E-mail: info@bjbookbinding.com

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 Departmental requirements are satisfied; and
   • administering the final oral examination.

2. The Committee consists of:
   • the student's major professor;
   • one other NERHP faculty member;
   • the student's minor professor, or if no minor is selected, committee member must be from outside of department; and
   • the Graduate Council Representative.

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/current/dgreeecommittee.html#council
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 NERHP faculty member; and
   - the student's minor professor, or if no minor is selected, committee member must be from the department.
   
   \textit{Note: No Graduate Council Representative is required for the MHP or MEng oral exam.}

2. The makeup of the exam committee shall 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. 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 (only once) or may be asked to leave the program without receiving the degree.
MS / MENG IN NUCLEAR ENGINEERING

a. At a minimum, the student's program shall contain the courses below (or be able to show equivalency);  
b. Students without NE background should take the courses below (or be able to show equivalency); and  
c. The remainder of the student's major program can be a compilation of any other 500 or 600 level classes taught in the Department.

### Major Core Courses For All NE Students

<table>
<thead>
<tr>
<th>Course</th>
<th>Number of Credits</th>
<th>Term Offered</th>
</tr>
</thead>
<tbody>
<tr>
<td>NE 553 Advanced Reactor Physics</td>
<td>3</td>
<td>Spring</td>
</tr>
<tr>
<td>NE 535 Radiation Shielding and External Dosimetry</td>
<td>4</td>
<td>Spring</td>
</tr>
<tr>
<td>NE 568 Nuclear Reactor Safety</td>
<td>3</td>
<td>Winter</td>
</tr>
<tr>
<td>NE 565 Applied Reactor Thermal Hydraulics</td>
<td>3</td>
<td>Winter</td>
</tr>
<tr>
<td>NE 536 Advanced Instrumentation</td>
<td>4</td>
<td>Winter</td>
</tr>
<tr>
<td>NE 507 Seminar (three terms required)</td>
<td>3 (1 each)</td>
<td>Fall, Winter, Spring</td>
</tr>
</tbody>
</table>

**Major Core Total (for all)** 19

### Additional Requirements for Students w/o an NE Background

<table>
<thead>
<tr>
<th>Course</th>
<th>Number of Credits</th>
<th>Term Offered</th>
</tr>
</thead>
<tbody>
<tr>
<td>NE 515 Nuclear Rules and Regulations</td>
<td>2</td>
<td>Fall</td>
</tr>
<tr>
<td>NE 531 Radiophysics</td>
<td>3</td>
<td>Fall</td>
</tr>
<tr>
<td>NE 551 Neutronics Analysis I</td>
<td>3</td>
<td>Fall</td>
</tr>
<tr>
<td>NE 552 Neutronics Analysis II</td>
<td>3</td>
<td>Winter</td>
</tr>
<tr>
<td>NE 567 Reactor Thermal Hydraulics</td>
<td>4</td>
<td>Fall</td>
</tr>
<tr>
<td>NE 574 Nuclear Systems Design I</td>
<td>4</td>
<td>Winter</td>
</tr>
<tr>
<td>NE 575 Nuclear Systems Design II</td>
<td></td>
<td>Spring</td>
</tr>
<tr>
<td>NE 557 Advanced Nuclear Reactor Lab</td>
<td>2</td>
<td>Spring</td>
</tr>
</tbody>
</table>

**Total Additional Requirements** 21

### Other Requirements / Electives

<table>
<thead>
<tr>
<th>Course</th>
<th>Number of Credits</th>
<th>Term Offered</th>
</tr>
</thead>
<tbody>
<tr>
<td>NE 503 Thesis (MS students)</td>
<td>6</td>
<td>All terms; discuss w/ your major professor</td>
</tr>
<tr>
<td>500 or 600 level courses (electives) taught in the Department</td>
<td>varies</td>
<td>varies</td>
</tr>
</tbody>
</table>

**Other Requirements / Electives Total** varies

**Total Required Credits for the Degree** 45

NOTE: Term offerings may be subject to change.
### MS / MHP IN RADIATION HEALTH PHYSICS

a. At a minimum, the student's program shall contain the courses below (or be able to show equivalency);

b. These courses should be taken as soon as possible in preparation for the thesis. It is noted that not all courses shown below are offered every year.

c. The remainder of the student's major program can be a compilation of any other 500 or 600 level classes taught in the Department. Ecampus students may take courses outside of the department or university with the approval of the major professor prior to registration.

<table>
<thead>
<tr>
<th>Major Core Courses</th>
<th>Number of Credits</th>
<th>Term Offered</th>
</tr>
</thead>
<tbody>
<tr>
<td>RHP 515 Nuclear Rules &amp; Regulations</td>
<td>2</td>
<td>Fall</td>
</tr>
<tr>
<td>RHP 516 Radiochemistry</td>
<td>4</td>
<td>Spring (on-campus)</td>
</tr>
<tr>
<td>OR</td>
<td></td>
<td>Summer (Ecampus)</td>
</tr>
<tr>
<td>RHP 517 Radionuclides in Life Sciences</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>RHP 531 Radiophysics</td>
<td>3</td>
<td>Fall</td>
</tr>
<tr>
<td>RHP 535 Radiation Shielding and External Dosimetry</td>
<td>4</td>
<td>Spring</td>
</tr>
<tr>
<td>RHP 536 Advanced Radiation Detection</td>
<td>4</td>
<td>Winter (on-campus)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Summer (Ecampus)</td>
</tr>
<tr>
<td>RHP 582 Applied Radiation Safety</td>
<td>4</td>
<td>Winter</td>
</tr>
<tr>
<td>RHP 583 Radiation Biology</td>
<td>4</td>
<td>Winter</td>
</tr>
<tr>
<td>RHP 588 Radioecology</td>
<td>3</td>
<td>Fall</td>
</tr>
<tr>
<td>RHP 590 Internal Dosimetry</td>
<td>3</td>
<td>Winter (on-campus)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Spring (Ecampus)</td>
</tr>
<tr>
<td>RHP 507 Seminar (three terms required)</td>
<td>3 (1 each)</td>
<td>Fall, Winter, Spring</td>
</tr>
</tbody>
</table>

**Major Core Total** 34

<table>
<thead>
<tr>
<th>Other Requirements / Electives</th>
<th>Number of Credits</th>
<th>Term Offered</th>
</tr>
</thead>
<tbody>
<tr>
<td>RHP 503 Thesis</td>
<td>6</td>
<td>All terms; discuss w/ your major professor</td>
</tr>
<tr>
<td>500 or 600 level courses (electives) taught in the Department (Ecampus students can take grad level electives within other departments / universities, but classes are subject to approval by the advisor prior to registration)</td>
<td>5 – 11</td>
<td>varies</td>
</tr>
</tbody>
</table>

**Other Requirements / Electives Total** 11

**Total Required Credits for the Degree** 45

NOTE: Term offerings may be subject to change.
## MS IN MEDICAL PHYSICS

<table>
<thead>
<tr>
<th>Major Core Courses</th>
<th>Number of Credits</th>
<th>Term Offered</th>
</tr>
</thead>
<tbody>
<tr>
<td>RHP 531 Radiophysics</td>
<td>3</td>
<td>Fall</td>
</tr>
<tr>
<td>MP 535 Radiation Shielding &amp; External Dosimetry</td>
<td>4</td>
<td>Spring</td>
</tr>
<tr>
<td>MP 536 Advanced Radiation Detection</td>
<td>4</td>
<td>Winter</td>
</tr>
<tr>
<td>MP 582 Applied Radiation Safety</td>
<td>4</td>
<td>Winter</td>
</tr>
<tr>
<td>MP 583 Radiation Biology</td>
<td>4</td>
<td>Winter</td>
</tr>
<tr>
<td>MP 562 Radiation Therapy</td>
<td>3</td>
<td>Fall</td>
</tr>
<tr>
<td>MP 563 Applied Therapy</td>
<td>3</td>
<td>Winter</td>
</tr>
<tr>
<td>MP 564 Applied Therapy Lab</td>
<td>2</td>
<td>Spring</td>
</tr>
<tr>
<td>MP 541 Diagnostic Imaging Physics</td>
<td>3</td>
<td>Spring</td>
</tr>
<tr>
<td>MP 507 Seminar / Oncology for the Physicist (1 credit)</td>
<td>3 total</td>
<td>TBA</td>
</tr>
<tr>
<td>AND MP 507 Seminar / Journal Club (1 cr / ea; 2 cr needed)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ST 511 Statistics</td>
<td>3</td>
<td>Fall, Winter, Spring</td>
</tr>
<tr>
<td>CON 650 (OHSU-Portland) Principles of Scientific Conduct</td>
<td>2</td>
<td>Fall</td>
</tr>
<tr>
<td>OR PHL 544 (OSU-Corvallis) Biomedical Ethics</td>
<td>4</td>
<td>Fall</td>
</tr>
<tr>
<td>MP 510 Clinical Practice</td>
<td>3-12</td>
<td>TBA</td>
</tr>
<tr>
<td>MP 503 Thesis</td>
<td>6</td>
<td>Any Term</td>
</tr>
</tbody>
</table>

**Total Required Credits for the Degree**: 51 minimum

NOTE: Term offerings may be subject to change.
**PROCEDURES LEADING TO A MASTER’S DEGREE**

Below is an outline of the steps required to obtain the Master’s degree. You should become familiar with the specific and detailed information contained in the Graduate School Catalog, as well as Departmental requirements. Final oral exams may be scheduled only during periods when classes are in session (including finals week).

<table>
<thead>
<tr>
<th>Procedure for MS Students</th>
<th>Step</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td>Choose a major professor and a general thesis topic</td>
<td>By the end of your second term</td>
</tr>
<tr>
<td><strong>2</strong></td>
<td>File a Masters Program of Study form (Grad School website)</td>
<td>Before completing 18 credit hours</td>
</tr>
<tr>
<td><strong>3</strong></td>
<td>Compare Program form and transcripts for consistency File Petition to Change Program form if needed File a Diploma Application (Grad School website)</td>
<td>1 – 2 terms before your intended graduation term For example: Fall or Winter for a Spring defense</td>
</tr>
<tr>
<td><strong>4</strong></td>
<td>Notify your major professor of your intended graduation term</td>
<td>AT LEAST 1 term before your intended graduation term</td>
</tr>
<tr>
<td><strong>5</strong></td>
<td>Read the Thesis Guide on the Grad School’s website</td>
<td>Prior to starting or finishing your thesis</td>
</tr>
<tr>
<td><strong>6</strong></td>
<td>Complete a final draft of your thesis and submit it to your major professor for review and approval</td>
<td>By the start of your last term</td>
</tr>
<tr>
<td><strong>7</strong></td>
<td>Appoint Masters Committee w/approval of your major professor</td>
<td>During the last term, preferably at the beginning of that term</td>
</tr>
<tr>
<td><strong>8</strong></td>
<td>Contact the Grad School to obtain the Grad Council Rep (GCR) list and contact those people until you find someone willing to serve as your GCR</td>
<td>While forming committee</td>
</tr>
<tr>
<td><strong>9</strong></td>
<td>Decide on a day / time (2 hrs) with all Committee members (faculty &amp; Grad Council Rep) Reserve a room with the RC receptionist (Ecampus students need to contact the dept staff)</td>
<td>As soon as you have your committee formed</td>
</tr>
<tr>
<td><strong>10</strong></td>
<td>Fill out Exam Scheduling Form (Grad School website)</td>
<td>As soon as your committee has agreed on a day and time</td>
</tr>
<tr>
<td><strong>11</strong></td>
<td>Submit a final draft of the thesis to all committee members</td>
<td>AT LEAST 2 weeks before the defense; confer with your advisor first</td>
</tr>
<tr>
<td><strong>12</strong></td>
<td>Confirm exam / defense appointment with the Grad School (make sure it’s on their calendar!)</td>
<td>1 week after submitting exam scheduling form</td>
</tr>
<tr>
<td><strong>13</strong></td>
<td>Tell the Student Liaison the confirmed defense date</td>
<td>After the Grad School confirms</td>
</tr>
<tr>
<td><strong>14</strong></td>
<td>Post fliers of your defense (day, time, room, topic, your name, etc.) around the RC E students must e-mail the Student Liaison about this</td>
<td>AT LEAST 1 week before your defense</td>
</tr>
<tr>
<td><strong>15</strong></td>
<td>Remind (e-mail) Committee of the defense appt</td>
<td>2 days before your defense</td>
</tr>
<tr>
<td><strong>16</strong></td>
<td>Defend your thesis</td>
<td>Day of your defense</td>
</tr>
<tr>
<td><strong>17</strong></td>
<td>Complete revisions, have major professor approve &amp; sign final version, and then get 2 copies bound for the dept Submit final copies (library, Grad School, and dept)</td>
<td>Within 6 weeks of the defense or by the first day of the next term, whichever is first; if you miss the deadline, you will be required to register for an additional 3 credits, no exceptions!</td>
</tr>
</tbody>
</table>
## Procedures for MEng and MHP Students

<table>
<thead>
<tr>
<th>Check Box</th>
<th>Item #</th>
<th>Step</th>
<th>Timing</th>
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<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Choose a major professor (your advisor)</td>
<td>By the end of your second term</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>File a Masters Program of Study form (Grad School website)</td>
<td>Before completing 18 credit hours</td>
</tr>
</tbody>
</table>
|           | 3      | Notify your major professor of your intended graduation date (the specific term)  
|           |        | *****AND***** Choose an area of specialization within your major and notify your major professor of the area | AT LEAST 1 term before your intended graduation term |
|           | 4      | Compare Program form and transcripts for consistency                 | 1 – 2 terms before your intended graduation term |
|           | 5      | File Petition to Change Program form if needed                       | By the beginning of your intended graduation term |
|           | 6      | File a Diploma Application (Grad School website)                     | By the end of week two of your last term (firm deadline) |
|           | 7      | Begin studying for your exam by reading through all of your class notes, textbooks, PowerPoint slides, etc. | AT LEAST 1 term before your intended graduation term |
|           | 8      | Appoint Masters Committee w/approval of your major professor         | During your last term, preferably at the beginning of the term if not earlier |
|           | 9      | Decide on a day / time (2 hrs) with all Committee members            | As soon as you have your committee formed |
|           |        | *****AND***** Reserve a room with the RC receptionist (Ecampus students can reserve the room w/Joan or Kristie) | |
|           | 10     | Fill out Exam Scheduling Form (Grad School website)                  | As soon as your committee has agreed on a day and time |
|           | 11     | Confirm exam appointment with the Grad School                        | 1 week after completing #10         |
|           | 12     | Notify the NERHP Student Liaison of the confirmed exam day, time, and room number  
|           |        | *****AND***** Make travel arrangements (Ecampus students)            | After receiving confirmation of the appt w/ the Grad School (#11) |
|           | 13     | Remind (e-mail) Committee members of the defense appointment         | 2 days before your exam             |
|           | 14     | Take your comprehensive oral exam                                    | Day of your exam                    |
DOCTORAL DEGREE PROGRAM

The Nuclear Engineering and Radiation Health Physics Department (NE/RHP) offers Doctoral Degrees in the following programs:

- Nuclear Engineering (NE);
- Radiation Health Physics (RHP); and
- Medical Physics (MP).

COURSE OF STUDY

1. The university requirements for the doctorate include the following:
   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 36 credit hours of dissertation research (thesis course) has been accumulated;
   d. a minimum of one year of residence, continuously, at OSU (i.e., three consecutive quarters as a full-time student);
   e. passing a preliminary oral examination in the major subject; and
   f. successfully defending the dissertation in an oral presentation to a panel of experts.

For other regulations, see the OSU Graduate School Catalog.

2. In addition, departmental 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) a substantial fraction of the graduate courses offered in the Department;
   c. on assignment from the student’s doctoral committee, taking and passing (B average or higher) such minor subject courses as judged desirable for satisfactory progress in doctoral research;
   d. 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
   e. preparation and presentation of a written dissertation proposal - this paper will include a thorough literature review, 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.

3. As noted above, the student’s principal direction in the course of study comes from the doctoral committee, in which the major professor has final approval. The NERHP Department members on the doctoral committee will generally expect:
   a. research credit in excess of 36 hours; and
   b. total course work credit of 72 hours or more, not including research. The minimum Graduate School requirement is 108 hours, including research.

These, however, are guidelines and the doctoral committee can change them at its discretion.
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 Departmental 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 consists of:
   • the student's major professor;
   • two other NERHP faculty members;
   • the student's minor professor, or if no minor is selected, one committee member from outside the department; and
   • one Graduate Council Representative.

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/current/degreecommittee.html#council

4. The Committee should be appointed in the first term of attendance (matriculation).

MATRICULATION / CANDIDACY

1. Applicants for the doctorate are required to have a Master's degree in NE or RHP, or equivalent as judged by the Department of Nuclear Engineering and Radiation Health Physics Graduate Committee. This equivalence may be a degree earned, but not yet awarded, or a degree in another related field with a significantly strong NE or RHP minor.

2. 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 (prior to sitting for the Qualifying Exam).

   These steps shall be taken during the first quarter.

3. 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 of residence.

WRITTEN QUALIFYING EXAMINATIONS FOR DOCTORAL STUDENTS

1. A written exam ("the qualifier") is required of all Ph.D. students. Upon passing the exam, the student is categorized as a Ph.D. "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 early Fall (around mid October). Additional or alternate examination periods may be scheduled at the discretion of the Departmental Graduate Committee Chair.
3. The examination will be supervised and evaluated by an examination committee chosen from
the departmental graduate faculty. The Chair of the Departmental Graduate Committee will
also chair the examination committee. If the Graduate Committee Chair has one of his/her
students sitting for the qualifier, an alternate will be named to chair the exam committee.

4. Students entering the doctoral program with a Master’s Degree from another institution are
expected to take the qualifying examination during the Fall term of their second year.
Students continuing for the Ph.D. after receiving a Master’s degree in Medical Physics,
Nuclear Engineering, or Radiation Health Physics at OSU generally will take the qualifying
exam the next time it is offered after completion of their final examination and thesis.

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 (NE, RHP, or
      MP) 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. OSU Dept of Nuclear Engineering courses covered in this part
      of the exam include:

      NE/RHP 531 Radiophysics
      NE/RHP 536 Advanced Radiation Detection and Measurement
      NE/RHP 582 Applied Radiation Safety

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

      Medical Physics Core Courses
      These requirements are in the developmental stage currently.
      Nuclear Engineering Core Courses
      NE 551/552/553 Neutronics Analysis & Laboratory
      NE 567 Advanced Nuclear Reactor Thermal Hydraulics
      NE 574 Nuclear Engineering Design
      Radiation Health Physics Core Courses
      RHP 535 Radiation Shielding and External Dosimetry
      RHP 582 Applied Radiation Safety
      RHP 583 Radiation Biology
      RHP 588 Radioecology
      RHP 590 Internal Dosimetry

   c. Nuclear Engineering, Radiation Health Physics, or Medical Physics Selected Topics
      (25%), consisting of one three-hour, closed-book written examination in specialized
      topics within each student’s 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 Chair of
the examination 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 examination 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 Nuclear Engineer or Radiation Health Physics, 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.

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 Departmental Graduate Committee, be given the opportunity to retake the entire exam.

9. Students should begin preparing for and complete the oral preliminary exam within three months after having passed the qualifying exam

**ORAL PRELIMINARY EXAMINATION**

Ph.D. candidates will present their proposed dissertation research as part of their preliminary exam. This formal seminar should be given within three months of passing the departmental qualifying examination and is to be a presentation of their planned research and a review of the literature supporting this plan.

As a means for giving the student’s committee an early chance to help direct the doctoral research, the preliminary examination will consist of discussions concerning the student’s research direction with a 30 minute (or amount of time determined by the major professor) presentation by the student on his/her proposed research. 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 Medical Physics, Nuclear Engineering, or Radiation 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 oral examination.
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 Medical Physics, Nuclear Engineering, or Radiation 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. With your major professor's approval, this requirement can be satisfied by utilizing the "manuscript format" for the dissertation. A final draft of this paper for submission must be presented to the major professor at least two weeks prior to the final oral examination.

A copy of the booklet "Preparation of the Thesis" is available for purchase at the OSU Bookstore.

FINAL ORAL EXAMINATIONS
The dissertation defense will be scheduled for two hours at a minimum. The student is expected to display a mastery of knowledge in his/her field and professional maturity as a Medical Physicist, Nuclear Engineer, or Health Physicist.

PROCEDURES LEADING TO THE DOCTORAL DEGREE
Below is a brief list of the steps required to obtain the Ph.D. degree. You should also become familiar with the specific and detailed information contained in the Graduate School Catalog as well as Departmental requirements. Program meetings, preliminary oral exams, and final oral exams may be scheduled only during periods when classes are in session (including finals week).
## Procedures for PhD Students

<table>
<thead>
<tr>
<th>Check Box</th>
<th>Item #</th>
<th>Step</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Form Doctoral Committee</td>
<td>Before the end of the first term</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>Schedule doctoral program meeting with all committee members; reserve a RC room w/the RC receptionist</td>
<td>Schedule at least one wk prior to the meeting date</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em><strong><strong>AND</strong></strong></em> File the Doctoral Program of Study</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>Take written qualifying exam; a notice will be sent regarding the exam days/times. Upon passing, the student becomes a PhD “Candidate”</td>
<td>Fall term of the first year</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>Work with your major professor to reach a final draft stage of the dissertation research proposal</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>Submit the research proposal to the entire Committee</td>
<td>At least 2 wks before step 5 (must have advisor’s approval first)</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>Schedule the Oral Preliminary Exam w/your committee</td>
<td>About 18-24 months before defense</td>
</tr>
<tr>
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<td></td>
<td><em><strong><strong>AND</strong></strong></em> Reserve a room in the RC w/the receptionist</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td><em><strong><strong>AND</strong></strong></em> Schedule Oral Prelim w/ the Grad School (form)</td>
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<tr>
<td>7</td>
<td>7</td>
<td>Take and pass the Oral Preliminary Exam</td>
<td>Throughout your degree progression</td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>Hold regular meetings with your Committee (at least once a year) to keep them updated on your progress</td>
<td>About one term prior to defense</td>
</tr>
<tr>
<td>9</td>
<td>9</td>
<td>Compare Doctoral Program of Study with transcripts and update Program if changes occurred (and see #8)</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>10</td>
<td>Decide on a day / time (2 hrs) with all committee members (faculty and Grad Council Rep)*</td>
<td>At least one term prior to defense</td>
</tr>
<tr>
<td>11</td>
<td>11</td>
<td>File the Diploma Application with the Graduate School</td>
<td>See important (*) note on next page</td>
</tr>
<tr>
<td>12</td>
<td>12</td>
<td>Reserve a room with the RC receptionist</td>
<td>At least three weeks prior</td>
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<td><em><strong><strong>AND</strong></strong></em> Fill out Exam Scheduling Form (Grad School website) to schedule the final oral exam (defense).</td>
<td>At least two to three weeks prior</td>
</tr>
<tr>
<td>13</td>
<td>13</td>
<td>Work with your advisor to reach a final draft stage of the dissertation</td>
<td>Throughout your degree progression</td>
</tr>
<tr>
<td>14</td>
<td>14</td>
<td>Distribute one copy to each committee member after your advisor approves your final draft.</td>
<td>After your major professor tells you to (AT LEAST 2 wks before the defense)</td>
</tr>
<tr>
<td>15</td>
<td>15</td>
<td>Confirm exam / defense appt with the Grad School</td>
<td>At least 1 wk before the date of #17</td>
</tr>
<tr>
<td>16</td>
<td>16</td>
<td>Post fliers of your defense (day, time, room, topic, your name, etc.) around the RC</td>
<td>At least one week before the final oral exam (defense) date.</td>
</tr>
<tr>
<td>17</td>
<td>17</td>
<td>Send an e-mail reminder to your committee members</td>
<td>About 3-5 days before the defense</td>
</tr>
<tr>
<td>18</td>
<td>18</td>
<td>Take and pass the final oral exam (defense)</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>19</td>
<td>Make corrections to the dissertation</td>
<td>Within 6 wks of the defense or by the first day of the next term, whichever is first; if you miss the deadline, you will be required to register for an additional 3 credits, no exceptions!</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em><strong><strong>AND</strong></strong></em> Have your dissertation bound</td>
<td></td>
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<td></td>
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<td><em><strong><strong>AND</strong></strong></em> Submit final copies (library, Grad School, and dept)</td>
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</table>
NOTES ABOUT THE CHECKSHEET

The Doctoral Program of Study form is located on the Graduate School’s website. You should work with your advisor to fill out the Program of Study form before you hold your doctoral program meeting because your committee needs to approve the Program of Study before you can submit it to the Graduate School.

The Written Qualifying exam is offered only in the Fall term, usually in mid October. 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 out the 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 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 making sure your exam is 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

BOOKBINDING SERVICES IN CORVALLIS

The department 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