

Washington State University
MAJOR CHANGE FORM – REQUIREMENTS

NOTE: If proposing a new program (degree) or extending, moving, consolidating, eliminating or renaming an existing program (degree), these proposals must first go through the Provost's Office review process. Please do not use this form. Please contact the Provost's Office for directions on processing program (degree) proposals.

SUBMITTING PROPOSAL – Follow the steps on form, then:

- ☐ Submit one electronic copy of complete packet of signed form/rationale statement/supporting documentation and/or edits to wsu.curriculum@wsu.edu.
- ☐ Send the original stapled packet PLUS 10 stapled copies of packet to the Registrar's Office, campus mail code 1035.

Department Name Materials Science and Engineering Program

1. Check proposed changes:

- ☐ New Plan (Major) in _____ CIP# _____
- ☐ Change name of Plan (Major) from _____ to _____
- ☐ Revise certification requirements for the Plan (Major) in _____
- ☐ Revise Plan (Major) requirements in _____
- ☐ Drop Plan (Major) in _____
- ☐ New Sub-Plan (Option) in _____ CIP# _____
- ☐ Change name of Sub-Plan (Option) from _____ to _____
- ☐ Revise requirements for the Sub-Plan (Option) in _____
- ☐ Drop Sub-Plan (Option) in _____
- ☐ New Minor in _____ CIP# _____
- ☐ Change name of Minor from _____ to _____
- ☐ Revise Minor requirements in _____
- ☐ Drop Minor in _____
- ☐ New Certificate in _____ CIP# _____
- ☒ Change name of Certificate from Nuclear Engineering to Nuclear Materials
- ☒ Revise Certificate requirements in Nuclear Materials
- ☐ Drop Certificate in _____
- ☐ Other _____

2. Effective Date: ^{Spr} Fall 16 (Requirement changes are effective for following fall terms.) Submission deadline is Oct 1st.
NOTE: Items received after deadlines may be put to the back of the line or forwarded to the following year. Please submit on time.

Contact: Aurora Clark Phone number: 5-3362
Email: avclark@wsu.edu Campus mail code: 4630

3. PLEASE ATTACH A RATIONALE STATEMENT giving the reasons for each request marked above, and explaining how this impacts other units in Pullman and other campuses (if applicable).
4. PROVIDE SUPPORTING DOCUMENTATION AND/OR CURRENT CATALOG COPY with edit marks showing requested changes.

5. SIGN AND DATE APPROVALS.

<u>Aurora Clark</u> 1/6/15 Chair Signature/date	<u>William Andrews</u> - William Andrews, Jr. 1/27/15 Dean Signature/date	CSC Date	
<u>Phil Kessler</u> 1/12/15 Chair Signature/date M. Kessler, MME	<u>C. Claiborn</u> 1/13/15 Dean Signature/date C. Claiborn, CEA	AAC or GSC Date	Senate Date

GRADUATE CERTIFICATE PROGRAM IN NUCLEAR MATERIALS

Materials Science and Engineering Program (MSEP)

1. Statement of Need

This certificate program will benefit students who wish to pursue employment opportunities in the multifaceted nuclear industry. The northwest United States has long been a hub of research and industrial activity in nuclear science. This includes the Tri-Cities region, which is a center for nuclear industry employment and the site of the Hanford Nuclear Reservation, the Columbia Generating Station (currently the only operating commercial plant in the northwest), the largest nuclear waste treatment project in the nation, and Pacific Northwest National Laboratory (PNNL - a multiprogram laboratory of the Department of Energy). PNNL has recently expanded its infrastructure capabilities in nuclear materials and is actively developing nuclear materials characterization capabilities at its Radiochemical Processing Lab. The Tri-Cities also hosts several business in nuclear fuels (Areva) and nuclear medical isotopes (IsoRay). Not to be ignored is the significant nuclear reactor design expertise found at Idaho National Laboratory (INL), in Idaho Falls. At the same time, WSU has significantly grown training and research opportunities for graduate and undergraduate students enabled by Department of Energy investments in WSU's Nuclear Radiation Center, one of a few university research reactors in the nation, and major growth of the Radiochemistry research emphasis within the Department of Chemistry.

The proposed Graduate Certificate in Nuclear Materials provides formal academic coursework to scientists and engineers whose primary training is in a non-nuclear discipline; statistics show that only a small portion of scientists and engineers employed in the nuclear industry, ~5%, have a nuclear degree. Thus this certification program addresses the needs and expectations of the current industry.

2. Program Requirements

Graduate certificate programs are designed for part-time study without formal admission to a degree program. Part-time students admitted to a certificate program will be classified as "Not-Advanced-Degree-Candidate" (NADC), meaning a student with a baccalaureate degree who wishes to take graduate courses but does not wish to pursue a graduate degree. This classification is defined in more detail in the Graduate School *Policies & Procedures*. Students currently enrolled in regular graduate degree programs at WSU (master's or doctoral) may concurrently enroll in graduate certificate programs with the approval of their committee. To qualify as a part-time certificate student, a prospective student must:

- Have a bachelor's degree from an accredited post-secondary institution.
- Meet all prerequisite course requirements or be able to demonstrate equivalent knowledge and understanding for courses prior to enrollment.

- Complete the on-line Graduate School application form prior to enrollment in their first course (indicating their interest in a certificate program), pay the appropriate application fee, and submit the required application material of our School.
- Maintain the requirements to be a student in good standing in the Graduate School and MSEP program while enrolled as a certificate student.

The maximum time allowed for completion of a certificate is 6 years from the beginning date of the earliest course applied toward the certificate. Extensions may be granted on a case-by-case basis.

3. Statement of Resources

The Graduate Certificate Program in Nuclear Materials draws upon the existing resources of the Materials Science and Engineering Program (MSEP) and also includes the School of Mechanical and Materials Engineering and Chemistry Department.

We expect this program to be desirable to traditional students in addition to those who are working professionals in the region's nuclear industries. Course offerings from the graduate certificate program will be made available on the AMS system and/or on streaming video when possible. Courses may be offered late in the day or evening to accommodate working professionals.

4. Description of Curriculum

These course offerings will address the following key components:

- Fundamental nuclear science and engineering
- Radiochemistry
- Reactor operation and engineering
- Safety
- Waste management

To obtain the certificate, students must complete a minimum of nine credits from the following list of courses, six credits of which must be at the graduate level. No S/F courses will be used or counted for the certificate; a grade B or higher is required in each course counting towards the certificate.

To receive the certificate, students must submit an *Application for Graduation for Graduate Certificate* with the appropriate signatures, pay a fee, and submit it to the Graduate School when the certificate coursework has been completed.

- **ME 461 Introduction to Nuclear Engineering** (3 credits). A broad introduction: applied nuclear physics, application to the nuclear fuel cycle and reactor core design, systems and safety.
- **ME 565 Nuclear Reactor Engineering** (3 credits). Nuclear reactor design problems in thermodynamics, fluid flow, heat transfer, fuel preparation, waste disposal, materials

selection; discussion of reactor types. Nuclear power plant licensing and related topics will also be introduced and discussed.

- **ME 579 Special Topics in Mechanical Engineering: Topics in Nuclear Engineering** (3 credits). Topics include: nuclear materials, nuclear fuel cycle, technology of fusion energy, and nuclear safeguards and security.
- **MSE 503 Current Topics in Materials Science and Engineering: Glass Science and Technology** (3 credits). A broad overview of the current state of knowledge in Glass Science & Technology. From windows to drinking glasses, from optical fiber to cell phone and computer displays and nuclear waste immobilization, glass is ubiquitous in our lives and has changed human history multiple times.
- **Chem 490 Reactor Operator Training** (1-3 credits). The essential subject matter needed to take the nuclear Reactor Operator licensing examination, which is administered by the U.S. Nuclear Regulatory Commission. Materials includes basic reactor physics, nuclear reactions, health physics and radiation safety, nuclear fuel behavior, nuclear reactor control systems, plant operations and regulatory compliance. The intended outcome is for the candidate to take the U.S. NRC examination to become a licensed Nuclear Plant Reactor Operator for the WSU research reactor.
- **Chem 521/522 Radiochemistry and Radiotracers** (2 credits with 1 credit lab). The courses provide understanding on basic radiochemistry and nuclear chemistry, including, but not limited to, concepts on nuclear stability, decay modes and kinetics, interactions of radiation with matter, radioanalytical instrumentation, health physics, radiolysis, neutron activation, and chemistry at tracer levels.
- **Chem 529 Selected Topics in Analytical Chemistry: Solution Chemistry for Nuclear Processes** (3 credits). A high level overview of the essential features of reactions occurring in condensed liquid phases, emphasizing aqueous and organic media, and biphasic liquid-liquid extraction systems.
- **Chem 550 Special Topics in Nuclear Processes and Radioactive Waste Management** (1-3 credits) May be repeated for credit. Prereq permission of instructor. Fundamental chemistry of the nuclear industry, chemical processing and waste management.

Contact person:

Professor Nathalie Wall

Department of Chemistry

Washington State University

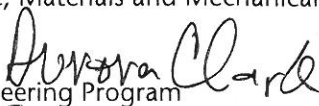
Ph. (509)-335-8917

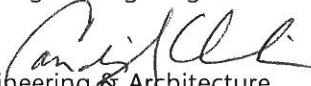
Email. nawall@wsu.edu

MEMORANDUM

TO: Bill Andrefsky, Dean
Graduate School

FROM: Lloyd V. Smith, Professor 
Chair, Graduate Studies Committee, Materials and Mechanical Engineering

Aurora Clark, Associate Professor 
Director, Materials Science & Engineering Program

APPROVED BY: Candis Claiborn, Professor 
Dean, Voiland College of Engineering & Architecture

Daryll DeWald, Professor 
Dean, College of Arts & Sciences

DATE: January 6, 2015

RE: **Request to transfer administration of the Graduate Certificate in Nuclear Engineering from the School of MME to the MSEP with an associated change in name to Graduate Certificate in Nuclear Materials**

The School of Mechanical and Materials Engineering (MME), along with the Materials Science and Engineering Program (MSEP), have considered and have the approval of their constituent faculty to transfer administration of the Graduate Certificate in Nuclear Engineering from MME to MSEP and to change the name of the certificate to the Graduate Certificate in Nuclear Materials. This move is motivated by:

- 1) Since its inception in 2009, the Graduate Certificate in Nuclear Engineering has only awarded 9 certificates and thus it has not fulfilled the anticipated need within the industrial communities for advanced training in this area.
- 2) It is the perspective of the faculty that currently teach the required courses for the certificate, that a Graduate Certificate in Nuclear Materials would better follow current market need for both students at WSU as well as potential industrial or national laboratory participants.
- 3) Recent hires in both MME and Chemistry have led to new courses with a materials emphasis within the Nuclear Fuel Cycle as a whole, and not just pertaining to the Nuclear Energy sector and engineering needs therein.
- 4) Many of these new hires are now graduate faculty within MSEP.
- 5) Thus, MSEP is a suitable administrative unit for the Certificate and has the flexibility and cross-cutting faculty whose teaching duties would form the basis for a change of the Graduate Certificate in Nuclear Engineering to a Graduate Certificate in Nuclear Materials.

The attached proposed Graduate Certificate in Nuclear Materials builds upon the prior coursework required for the Graduate Certificate in Nuclear Engineering, and adds new courses that are taught in MME and Chemistry. This includes Chem 490 Reactor Operator Training, Chem 521/522 Radiochemistry and Radiotracers, Chem 529 Selected Topics in Analytical Chemistry - Solution Chemistry in Nuclear Processes, and Chem 550 Special Topics in Nuclear Processes and Radioactive Waste Management.

If approved by the Deans, we anticipate the following outcomes for a Graduate Certificate in Nuclear Materials administered by the MSEP:

- 1) By expanding the allowable courses that fulfill the Certificate requirements to include Chemistry courses that emphasize analytical and characterization aspects of Nuclear Materials, we will broaden the student base by appealing to the large number of Radiochemistry students for whom the Certificate would offer enhanced job opportunities.
- 2) The proposed Certificate will allow WSU to take advantage of a new Nuclear Process Science initiative at PNNL. This five-year initiative utilizes PNNL capabilities in the Environmental Molecular Sciences Laboratory radiation annex and in the Category II Radiological Processing Laboratory, with a focus on creating a fundamental scientific understanding of key processes that underpin waste processing and proliferation detection. The purpose of the initiative is to strengthen PNNL's capabilities in nuclear materials characterization and nuclear processing signatures discovery. PNNL is interested in developing academic partners for the initiative and will likely require enhanced training opportunities for its staff members and future hires.

Thank you for your consideration of this request.

Attachment