



Proposal to the Senate Educational Policy Committee

*Please replace all text in italic with appropriate information before submitting your proposal.
Your entries should be in regular (not italic) font.*

PROPOSAL TITLE:

Curriculum Revision to the Ph.D. Requirements for the Department of Nuclear, Plasma, and Radiological Engineering, College of Engineering

SPONSOR:

James Stubbins, Department Head of Nuclear, Plasma, and Radiological Engineering,
jstubbin@illinois.edu, 333-6474

COLLEGE CONTACT:

Bill Buttlar, Associate Dean, Graduate, Professional, and Online Programs, College of Engineering, buttlar@illinois.edu, 333-0678

BRIEF DESCRIPTION:

We propose to change the number of course credits hours required for the PhD degree in NPRE from 32 to 24. Correspondingly the number of dissertation credit hours will increase from 32 to 40, keeping the total at 64 hours. The proposed PhD degree requirements are described below. No change is proposed in our MS degree requirements.

Total Course Hour Requirement:

At least 24 credit hours of graduate-level courses beyond the MS.
At least 40 credit hours of dissertation credit beyond the MS.

Required NPRE Courses:

NPRE 501 Fundamentals of Nuclear Engineering
NPRE 521 Interaction of Radiation with Matter

These courses are required only if not taken as a part of the MS degree. Students whose prior experience includes the equivalent of these core courses may elect, with Advisor and Department Head (or designee) approval, to take alternative graduate courses within the College of Engineering of similar level.

Elective NPRE Courses

For students with MS from the UIUC NPRE Department, at least **four** hours of graduate level (400 and above) NPRE courses, not including NPRE 402, 446, 596, or 599, are required.

These additional elective NPRE hours can be NPRE course hours taken as part of the MS degree as long as they are above the minimum number of NPRE hours required for that degree. Students who have demonstrated depth and breadth in the NPRE curricula through prior course credit may elect, with Advisor and Department Head (or designee) approval, to take alternative graduate courses within the College of Engineering to satisfy these elective NPRE course hours.

For students with MS not from the UIUC NPRE Department, at least **eight** hours of graduate level (400 and above) NPRE courses, not including NPRE402, 446, 596, or 599, are required.

Students who have demonstrated depth and breadth in NPRE curricula through prior course credit from other institutions may elect, with Advisor and Department Head (or designee) approval, to take alternative graduate courses within the College of Engineering to satisfy these elective NPRE hours.

500-Level Courses

At least eight hours of 500-level courses beyond the required NPRE 501 and 521, not including 596 and 599, are required.

- i. NPRE 554 Nuclear Engineering Lab Investigations and NPRE 597 Independent Study: Degree credit for these courses is permitted only with prior departmental approval and with a student detailed written report upon completion to be included in the student's file. Typically students cannot receive degree credit for NPRE 554 or 597 when taken from their Research Advisor.
- ii. NPRE 596: Seminar in Nuclear Science and Engineering is offered both Fall and Spring semesters for 0 or 1 hours. It is a required course that all graduate students must register for each semester. Only the Department Head (or designee) can excuse a student if there is a valid course conflict. This course does not count toward degree credit.

JUSTIFICATION:

Current NPRE graduate degree course work requirements include a minimum of 24 course credit hours for the MS and an additional 32 course credit hours for the PhD. The current PhD course requirements include 12 NPRE 500-level hours or 16 NPRE hours with at least 8 course hours at the 500-level. In addition, current PhD course requirements include completion of a minor defined by the Department (3 500-level courses or 2 500-level and 2 400-level courses outside of NPRE).

Based on surveys of PhD course requirements in other UIUC departments and in nuclear engineering programs at some peer universities, the traditional NPRE PhD course requirements are higher than other competitive programs. Further, based on a review of the experiences of our own PhD graduate students, we find that students can acquire both the depth and breadth of course-related knowledge and experience required for their professional development in fewer than 32 hours of coursework beyond the MS degree. A level of PhD coursework set at 24 hours beyond the MS is appropriate to accomplish the desired educational experience and to provide PhD students with more time to pursue and develop their research experience consistent with completing a dissertation which embodies major results and analyses. Furthermore, this change in PhD course requirements is consistent with allowing the doctoral students to complete their full degree requirements within a 3-year period, consistent with current time-to-graduation expectations,

**Course requirements for traditional Master's and Ph.D. programs at
Peer Institutions**

Traditional Master's and Ph.D. Programs	MS degree hours		PhD degree hours		MS+PhD hours
	Course	Thesis*	Course	Thesis*	Course
UC Berkeley	20		14		34
Michigan	20		12		32
Purdue	24		24		48
Wisconsin	16		29		45
MIT	22		28		40
Illinois (current)	24		32		56
Illinois (proposed)	24		24		48

*MS and PhD theses are required at these institutions but not all of them have the concept of course hours credit assigned for thesis research

**Course requirements for traditional Master's and Ph.D. Programs at Illinois College of
Engineering**

Traditional Master's and Ph.D. Programs	MS degree hours		PhD degree hours		MS+PhD hours
	Course	Thesis	Course	Thesis	Course
Aerospace Engineering	24	8	32	32	56
Agricultural and Biological Engineering	24	8	32	32	56
Bioengineering	32	4	12	52	44
Chemical & Biomolecular Engineering	20	12	12	64	32
Civil and Environmental Engineering	24	8	32	32	56
Computer Science	28	4	16	56	44
Electrical & Computer Engineering	24	8	24	40	48
Industrial and Enterprise Systems Engineering	24	8	32	32	56
Materials Science & Engineering	24	8	20	44	44
Mechanical Science & Engineering	24	8	20	44	44
Nuclear, Plasma & Radiological Engineering	24	8	32	32	56
Proposed Nuclear, Plasma & Radiological Engineering	24	8	24	40	48

BUDGETARY AND STAFF IMPLICATIONS: *(Please respond to each of the following questions.)*

1) Resources

- a. How does the unit intend to financially support this proposal?

This proposal does not have cost implications for the unit.

- b. How will the unit create capacity or surplus to appropriately resource this program? If applicable, what functions or programs will the unit no longer support to create capacity?

There are no capacity implications with respect to this proposed change.

- c. Will the unit need to seek campus or other external resources? If so, please provide a summary of the sources and an indication of the approved support.

There is no need or requirement to seek Campus or external support or resources based on this proposed change.

- d. Please provide a letter of acknowledgment from the college that outlines the financial arrangements for the proposed program.

There are no financial implications for this requested change.

2) Resource Implications

- a. Please address the impact on faculty resources including the changes in numbers of faculty, class size, teaching loads, student-faculty ratios, etc.

This proposed change will possibly reduce the numbers of course class hours that NPPE PhD students will take, in the case that they decide to strictly follow the course requirements and chose not to enroll in classes beyond those requirements. Thus, we do not anticipate changes in teaching loads or class sizes. Rather, we expect that this change will provide the opportunity to offer a wider variety of graduate courses. Since this is a PhD requirement change, we don't anticipate any change in student-faculty ratios.

- b. Please address the impact on course enrollment in other units and provide an explanation of discussions with representatives of those units. *(A letter of acknowledgement from units impacted should be included.)*

This proposed change will provide more flexibility for PhD students to choose appropriate graduate (500-level) courses, some in other units, while also reducing the numbers of those courses required to meet the PhD degree requirements. We anticipate that these two outcomes will offset one another and not impact other units.

- c. Please address the impact on the University Library *(A letter of estimated impact from the University Librarian must be included for all new program proposals. If the impact is above and beyond normal library business practices, describe provisions for how this will be resourced.)*

This proposed change will not impact the University Library.

- d. Please address the impact on technology and space (e.g. computer use, laboratory use, equipment, etc.)

This proposed change will not impact access and requirements for technology and space.

For new degree programs only:

- 3) Briefly describe how this program will support the University's mission, focus, and/or current priorities. Include specific objectives and measurable outcomes that demonstrate the program's consistency with and centrality to that mission.
- 4) Please provide an analysis of the market demand for this degree program. What market indicators are driving this proposal? What type of employment outlook should these graduates expect? What resources will be provided to assist students with job placement?
- 5) If this is a proposed graduate program, please discuss the programs intended use of waivers. If the program is dependent on waivers, how will the unit compensate for lost tuition revenue?

DESIRED EFFECTIVE DATE: Fall 2016

STATEMENT FOR PROGRAMS OF STUDY CATALOG: See Appendix B


CLEARANCES: (Clearances should include signatures and dates of approval. **These signatures must appear on a separate sheet.** If multiple departments or colleges are sponsoring the proposal, please add the appropriate signature lines below.)

Signatures:



Unit Representative:

12 October 2015
Date:



College Representative:

10-22-15
Date:



Graduate College Representative:

11/19/15
Date:

Council on Teacher Education Representative:

Date:

Appendix A: Proposed Curriculum Revisions

Current Requirements:	Current Hours	Revised Requirements:	Revised Hours
<i>PhD Class Requirement</i>		<i>PhD Class Requirement</i>	
Required Courses	8 Hours	Required Courses	8 Hours
Elective Course	24 Hours	Elective Courses	16 Hours
Total Thesis Required Hours	32 Hours	Total Thesis Required Hours	40 Hours
<i>Total Requirement</i>	64 Hours	<i>Total Requirement</i>	64 Hours

Total Course Hour Requirement:

At least 24 credit hours of graduate-level courses beyond the MS.

At least 40 credit hours of dissertation credit beyond the MS.

Required NPRE Courses:

NPRE 501 Fundamentals of Nuclear Engineering

NPRE 521 Interaction of Radiation with Matter

These courses are required only if not taken as a part of the MS degree. Students whose prior experience includes the equivalent of these core courses may elect, with Advisor and Department Head (or designee) approval, to take alternative courses of similar level.

Elective NPRE Courses

For students with MS from the UIUC NPRE Department, at least **four** hours of graduate level (400 and above) NPRE courses, not including NPRE 402, 446, 596, or 599, are required.

These additional elective NPRE hours can be NPRE course hours taken as part of the MS degree as long as they are above the minimum number of NPRE hours required for that degree. Students who have demonstrated depth and breadth in the NPRE curricula through prior course credit may elect, with Advisor and Department Head (or designee) approval, to take alternative courses to satisfy these elective NPRE course hours.

For students with MS not from the UIUC NPRE Department, at least **eight** hours of graduate level (400 and above) NPRE courses, not including NPRE402, 446, 596, or 599, are required.

Students who have demonstrated depth and breadth in NPRE curricula through prior course credit from other institutions may elect, with Advisor and Department Head (or designee) approval, to take alternative courses to satisfy these elective NPRE hours.

500-Level Courses

At least eight hours of 500-level courses beyond the required NPRE 501 and 521, not including 596 and 599, are required.

- i. NPRE 554 Nuclear Engineering Lab Investigations and NPRE 597 Independent Study: Degree credit for these courses is permitted only with prior departmental approval and with a student detailed written report upon completion to be included in the student's file. Typically students cannot receive degree credit for NPRE 554 or 597 when taken from their Research Advisor.

- ii. NPRE 596: Seminar in Nuclear Science and Engineering is offered both Fall and Spring semesters for 0 or 1 hours. It is a required course that all graduate students must register for each semester. Only the Department Head (or designee) can excuse a student if there is a valid course conflict. This course does not count toward degree credit.

Appendix B: Program of Study

npre.illinois.edu

Head of the Department: James F. Stubbins
Director of Graduate Studies: Rizwn Uddin
Associate Head of Academic Programs: Rizwan Uddin
216 Talbot Laboratory
104 South Wright Street
Urbana, IL 61801
(217) 333-3598, Admissions, (217) 333-2295 Main Line

E-mail: nuclear@illinois.edu

Major: Nuclear, Plasma, and Radiological Engineering
Degrees Offered: M.S., Ph.D.

Major: Engineering
Degrees Offered: M.Eng.
Graduate Concentration: Energy Systems

Medical Scholars Program: Doctor of Philosophy (Ph.D.) in Nuclear, Plasma, and Radiological Engineering and Doctor of Medicine (M.D.) through the [Medical Scholars Program](#).

Graduate Degree Programs

The Department of Nuclear, Plasma, and Radiological Engineering (NPRE) offers programs leading to Master of Science and Doctor of Philosophy degrees in Nuclear, Plasma, and Radiological Engineering. The Master of Science and Doctor of Philosophy degree programs are centered around three theme areas:

- nuclear power engineering
- fusion and plasma science and engineering
- radiological engineering and medical physics

Advanced course work and active research programs are offered in all of these areas.

The NPRE department also administers for the College of Engineering a Master of Engineering degree program with a Concentration in Energy Systems.

The Faculty of the Department are internationally recognized experts in the areas of: nuclear science and engineering, radiation processes and transport, materials science, thermal sciences, systems engineering, energy conversion processes and systems, plasma sciences and processing, fusion energy, radiation-based medical imaging and therapy, dosimetry and radiation protection, reliability and risk analysis, energy systems, and international security. Graduate students in the Department are active participants and contributors to these areas of education and research and typically pursue careers in one of these areas. Graduate students in the Department are also encouraged to take part in course work and research activities in other engineering and science departments to complement their professional development in the nuclear engineering field. Opportunity also exists for specializing in:

1. computational science and engineering via the [Computational and Science and Engineering](#) (CSE) graduate transcriptable concentration option
2. energy and sustainability engineering via the [Energy and Sustainability Engineering](#) (EaSE) graduate non-transcriptable certificate option.

Medical Scholars Program

The [Medical Scholars Program](#) permits highly qualified students to integrate the study of medicine with study for a graduate degree in a second discipline, including Nuclear, Plasma, and Radiological Engineering. Students in the Medical Scholars program must meet the specific requirements for both the [medical](#) and graduate degrees. On average, students take eight years to complete both degrees. The first year of the combined program is typically spent meeting requirements of the Nuclear, Plasma, and Radiological Engineering graduate degree.

Admission

Application for admissions to the master's and doctoral degree programs is open to all graduates in engineering, mathematics, and the physical sciences with a grade point average of at least 3.00 (A = 4.00) for the last two years of undergraduate work and any graduate work completed. Prerequisites for admission include a course in ordinary differential equations plus one other mathematics course beyond calculus; an intermediate course in atomic and nuclear physics or interaction of radiation with matter; a course in electrical circuit theory; a course in thermodynamics; a course in fluid mechanics or continuum mechanics; and a course introducing nuclear engineering. A student may be admitted before completion of these prerequisites, but he or she must allow additional time to make up for these deficiencies; courses taken to make up such deficiencies will not count toward the number of units required for the graduate degree. Transcripts and letters of recommendation are required. The [Graduate Record Exam \(GRE\)](#) is required. For full consideration of fall admission with financial aid, application receipt deadline is January 15. Students who wish to enter in the spring term should contact the Department before applying.

All applicants whose native language is not English are required to have a minimum [TOEFL](#) score of 79 (iBT), 213 (CBT), or 550 (PBT); or minimum [International English Language Testing System \(IELTS\)](#) academic exam scores of 6.5 overall and 6.0 in all subsections. Applicants may be exempt from the TOEFL if [certain criteria](#) are met. For those taking the TOEFL or IELTS, [full admission status](#) is granted for scores greater than 102 (TOEFL iBT), 253 (TOEFL CBT), 610 (TOEFL PBT), or 6.5 (IELTS). [Limited status](#) is granted for lesser scores and requires enrollment in [English as a Second Language \(ESL\) courses](#) based on an ESL Placement Test (EPT) taken upon arrival to campus.

Students may apply to the Medical Scholars Program prior to beginning graduate school or while in the graduate program. Applicants to the Medical Scholars Program must meet the admissions standards for and be accepted into both Nuclear, Plasma, and Radiological Engineering and the College of Medicine. An application to the Medical Scholars Program will also serve as the application to the Nuclear, Plasma, and Radiological Engineering graduate program. Further information on this program is available by contacting the Medical Scholars Program (125 Medical Sciences Building, (217)-333-8146, mspo@illinois.edu).

Faculty Research Interests

Faculty research interests cover a wide range including, but not limited to, those listed above under the Graduate Degree Programs section. Faculty in other related fields are available to supervise research for students through formal "affiliate faculty" appointments.

Doctor of Philosophy in Nuclear, Plasma, and Radiological Engineering

Course requirements for the Ph.D. degree include at least 24 graduate hours of course credit beyond those required for the M.S. degree. In addition, 40 or more graduate hours of doctoral thesis credit are required and typically take two or more additional years to complete. Students desiring to work toward the Ph.D. degree must pass the departmental qualifying examination to be admitted to doctoral study. The doctoral candidate must complete course work, pass a preliminary doctoral examination, write a doctoral thesis, and successfully defend the thesis at a final examination before a doctoral faculty committee. A doctoral student typically takes several courses in nuclear engineering plus additional courses that support a specialized research area and provide background in mathematics. Under exceptional circumstances and by approved petition, doctoral research may be undertaken off campus.

NPRE 599	Thesis Research (min-max applied toward degree)	40
NPRE 501 & NPRE 521	Fundamentals of Nuclear Engrg and Interact of Radiation w/Matter (if not taken while completing the M.S. degree)	0-8
NPRE 596	Seminar in Nuclear Sci & Engrg (registration for 1 hour every semester while in residence; credit does not apply toward the degree.)	0
8 hours of 500-level courses		8
4-8 hours of NPRE graduate level courses, not counting 402, 446, 501, 521, 596, or 599		4-8
Elective courses (subject to Other Requirements and Conditions below)		0-12
Total Hours		64

Other Requirements and Conditions¹

Other Requirements and Conditions may overlap

Consult department for details of minimum hours required within the unit.

Credit in [NPRE 402](#) or [NPRE 446](#) does not count toward the degree.

A Master's degree or equivalent is required for admission to the Ph.D. program.

Ph.D. exam and dissertation requirements:

Qualifying exam:²

Preliminary exam

Final exam or dissertation defense

Dissertation deposit

Minimum GPA: 2.75

¹ For additional details and requirements refer to the department's printed handbook and the [Graduate College Handbook](#).

Facilities and Resources

A wide range of major research resources is available for nuclear engineering research. In support of the plasma research area, there are over a dozen ultra-high-vacuum plasma analysis and processing facilities including major Z and Theta Pinches. The flagship device is a mid-size stellarator/tokamak called HIDRA: Hybrid Illinois Device for Research and Applications. It is used for fusion research as well as a variety of plasma-material interaction studies. Graduate students often perform interdisciplinary research work in the Materials Research Laboratory, Micro and Nanotechnology Laboratory, Coordinated Science Laboratory, National Center for Supercomputing Applications, and Beckman Institute for Advanced Science and Technology. The mechanical behavior program provides a variety of facilities for studies of nuclear materials, including the Advanced Materials Testing and Evaluation Laboratory. Other radiological laboratories are also available for environmental studies and nuclear spectroscopy, health physics and radiation studies, nuclear-waste management, thermal hydraulics and reactor safety, reactor physics and reactor kinetics, controlled nuclear fusion, direct energy conversion, and plasma physics. The Department is a participant in the Computational Science and Engineering Program on campus. In addition, a wide array of microcomputers and workstations are available.

Financial Aid

Most graduate students receive some form of financial aid. Fellowships are available to support the best applicants. Other students are supported as graduate research, teaching, or general assistants. Financial aid includes federally sponsored traineeships and fellowships and University and industry fellowships. The University is approved for several fellowships including those from the Department of Energy, Nuclear Regulatory Commission, the National Science Foundation, Hertz, and the Institute for Nuclear Power Operations. Part- and full-time assistantships include exemption from tuition and partial fees. All applicants, regardless of U.S. citizenship, whose native language is not English and who wish to be considered for teaching assistantships must demonstrate [spoken English language proficiency](#) by achieving a minimum score of 24 on the speaking subsection of the TOEFL iBT or 8 on the speaking subsection of the IELTS. For students who are unable to take the iBT or IELTS, a minimum score of 4CP is required on the [EPT test](#), offered on campus. All new teaching assistants are required to participate in the [Graduate Academy for College Teaching](#) conducted prior to the start of the semester.

UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

EP.16.42

Office of the Provost and Vice Chancellor
for Academic Affairs

Swanlund Administration Building
601 East John Street
Champaign, IL 61820



November 24, 2015

Bettina Francis, Chair
Senate Committee on Educational Policy
Office of the Senate
228 English Building, MC-461

Dear Professor Francis:

Enclosed is a copy of a proposal from the College of Engineering and the Graduate College to revise the Ph.D. program in the Department of Nuclear, Plasma and Radiological Engineering.

Sincerely,

A handwritten signature in cursive script that reads 'Kathryn A. Martensen'.

Kathryn A. Martensen
Assistant Provost

Enclosures

c: J. Stubbins
B. Buttlar
R. McElroy
J. Hart
A. McKinney

UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

Graduate College

204 Coble Hall
801 South Wright Street
Champaign, IL 61820-6210



**Executive
Committee
2015-2016 Members**

November 19, 2015

Wojtek Chodzko-
Zajko
Dean & Chair
Graduate College

Kathy Martensen
Office of the Provost
207 Swanlund MC-304

Members

Dear Kathy,

Abbas Aminmansour
Architecture

Enclosed please find the proposal from the College of Engineering and the Graduate College for a "Curriculum Revision to the Ph.D. Requirements for the Department of Nuclear, Plasma and Radiological Engineering".

John D'Angelo
Mathematics

Nicki Engeseth
Food Science &
Human Nutrition

The proposal was received by the Graduate College on October 29, 2015. It was forwarded to our Graduate College Executive committee where it was reviewed and approved at the November 16, 2015 meeting.

Susan Fowler
Special Education

I send the proposal to you now for further review.

Rutilio Fratti
Biochemistry

Sincerely,

Paul Hergenrother
Chemistry

A handwritten signature in black ink, appearing to read 'John C. Hart'.

John C. Hart
Executive Associate Dean
Graduate College

Kevin Jackson
Accountancy

Samantha Knoll
Mechanical Science
& Engineering

c: J. Stubbins
B. Buttlar
A. McKinney

John Lambros
Aerospace
Engineering

Isabel Molina
Media and Cinema
Studies &
Latina/Latino
Studies

Kirsten Phelps
Library and
Information Science

Sandra Rodriguez-
Zas
Animal Sciences

Mark Rood
Civil &
Environmental
Engineering

Lisa Rosenthal
Art & Design

Angeliki Tzanetou
Classics

Michelle Wang
Statistics/Psychology
Bioengineering

Name of existing Illinois (UIUC) degree: _____

Name of non-Illinois partnering institution: _____

Location of non-Illinois partnering institution:

State of Illinois US State: _____ Foreign country: _____

- B. Proposal to create a new academic unit (college, school, department, program or other academic unit):

Name of proposed new unit: _____

- C. Proposal to rename an existing academic unit (college, school, department, or other academic unit):

Current name of unit: _____

Proposed new name of unit: _____

- D. Proposal to reorganize existing units (colleges, schools, departments, or program):

1. Proposal to change the status of an existing and approved unit (e.g. change from a program to department)

Name of current unit including status: _____

2. Proposal to transfer an existing unit:

Current unit's name and home: _____

Proposed new home for the unit: _____

3. Proposal to merge two or more existing units (e.g., merge department A with department B):

Name and college of unit one to be merged: _____

Name and college of unit two to be merged: _____

Proposed name and college of new (merged) unit: _____

4. Proposal to terminate an existing unit:

Current unit's name and status: _____

- E. **Other educational policy proposals** (e.g., academic calendar, grading policies, etc.)

Nature of the proposal: _____

Revised 10/2012