



College of Engineering

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Date: 12 January 2011

To: Randy Smith
Vice Provost, Office of Academic Affairs

From: Ed McCaul 
Secretary, College of Engineering Committee on Academy Affairs (CCAA)

Subject: Semester Conversion Proposal for the PhD degree in Nuclear
Engineering

Attached is a letter from K. (Cheena) Srinivasan, Department Chair of Mechanical and Aerospace Engineering, which discusses their PhD degree in Nuclear Engineering. It should be noted Cheena's cover letter references Nuclear Engineering's MS, Undergraduate Minor, BS/MS option, and withdrawal of their Graduate Minor, all of which have previously been approved by CCAA and forwarded to CAA.

Nuclear Engineering's PhD semester proposal was reviewed by a subcommittee of CCAA. After reviewing the proposal and having some changes made to it the subcommittee recommended to the full committee that the proposal be approved. After a discussion, CCAA unanimously approved the proposal on the 12th of January 2011 and requested that I forward it to you for consideration by CAA. If you have any questions concerning this proposal please let me know.

To: Office of Academic Affairs
From: K. Srinivasan, ME Department Chair
Date: November 18, 2010

**Regarding: Semester Program Proposal for Doctor of Philosophy
in Nuclear Engineering**

The review and modification of graduate level courses within the Nuclear Engineering Program are performed by the NE Graduate Studies Committee, which includes all full-time nuclear engineering professors.

The Nuclear Engineering Program faculty has reviewed the requirements for transitioning existing programs from the quarter system to the semester system. There are currently two graduate nuclear engineering degrees offered:

1. PhD in Nuclear Engineering
2. MS in Nuclear Engineering

There are two non-degree minor programs:

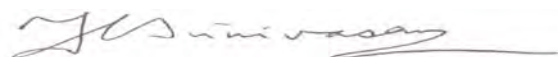
1. Graduate Minor in Nuclear Safety. This program has been inactive and will be cancelled.
2. Undergraduate Minor in Nuclear Engineering. This program will be continued. The revised program proposal is attached.

There is a BS/MS option in which the MS is in Nuclear Engineering. This option will continue to be offered under the semester system subject to the rules of the Graduate School. The Nuclear Engineering program also permits a dual master's degree, subject to Graduate School rules.

The planned modifications to the PhD program were presented to the Nuclear Engineering Advisory Committee consisting of representatives of academia and the nuclear industry for comment. These modifications were approved by vote of the Nuclear Engineering faculty who have autonomous responsibility for the academic administration of the program.

I recommend that this proposal be approved.

Signed and Approved:



K. Srinivasan

Nuclear Engineering Doctor of Philosophy (PhD) Program

Primary Contact: Tunc Aldemir (Aldemir.1@osu.edu, 292-4627)

1. Name of Program

Nuclear Engineering

2. Name of Degree

Doctor of Philosophy

3. Responsible Academic Unit

Department of Mechanical Engineering.

4. Type of Program

Graduate degree program

5. Semester Conversion Designation

a. Re-envisioned with significant changes to curricular requirements (core requirements, tracks/options/courses), but no changes in program goals.

6. Program Learning Goals

The objectives of the Doctor of Philosophy in nuclear engineering are:

1. Graduates with the Doctor of Philosophy degree will be attractive candidates for employment performing research in the nuclear industry or for an academic position at an educational institution.
2. Graduates will be informed and involved members of their communities, and responsible engineering professionals.

The outcomes of the Doctor of Philosophy degree are that a student will attain:

1. An in-depth understanding of the basics of nuclear engineering, reactor physics, radiation protection, nuclear power plant design, and nuclear safety;
2. An ability to perform high quality research;
3. An ability to teach;
4. An ability to work on multi-disciplinary teams;
5. An ability to identify, formulate, and solve engineering problems;

6. An understanding of professional, ethical, security and social issues and responsibilities, particularly as they relate to nuclear risks;
7. An ability to communicate effectively with a range of audiences;
8. A recognition of the need for, and an ability to engage in life-long learning and continuing professional development;
9. An understanding of contemporary issues, particularly related to reactor safety, nuclear proliferation, and the disposal of radioactive waste;
10. An ability to use the techniques, skills and modern engineering tools necessary for practice as a nuclear engineering professional;
11. An ability to apply mathematical foundations and algorithmic principles in the solution of engineering problems;

7. Semester Course Requirements

80 credit hours must be taken following the bachelor's degree. If the student holds an MS degree, the minimum number of additional credit hours is 50 cr. hr. A student does not need to obtain an MS degree prior to a PhD degree. However, all of the MS course requirements must be completed prior to obtaining the PhD degree.

Master's Degree Requirements

The MS degree has a requirement of 24 course credit hours out of a total graduation requirement of 30 credit hours.

The student must take NE 4505, Introduction to Nuclear Science and Engineering (3 cr.hr.), as a graduate student, if that course or equivalent was not taken as an undergraduate. It does not, however, count against the credit hour requirements. All full-time students are required to participate in the one credit hour seminar series, NE 6881. It does not, however, count against the credit hour requirements.

The following core courses are required:

- NE 5606, Radiological Safety (3 cr.hr.)
- NE 5742, Nuclear Radiations and Their Detection (3 cr.hr.)
- NE 6708, Reactor Theory (3 cr.hr.)
- NE 6536, Nuclear Reactor Systems and Analysis (3 cr.hr.)
- NE 6725, Reactor Dynamics (2 cr. hr.)
- NE 6726, Reactor Dynamics Laboratory (2 cr. hr.)
- NE 6766, Nuclear Engineering Design (2 cr. hr.)

In addition to the core courses, the student must take:

- A 5000-level mathematics course in the area of partial differential equations or linear algebra (3 cr. hr.). If the student has previously taken these courses,

another mathematics, statistics, or computer science course can be substituted with the approval of the GSC.

- An additional NE course at the 5000 level or higher (3 cr. hr.).
- A student is permitted to include 6 credit hours of thesis (NE5999) in satisfying the 30 cr. hr. minimum.

Additional Requirements Beyond MS Requirements

In addition, the students must complete 5000 level mathematics courses in the areas of partial differential equations and linear algebra (at least one of these is obtained prior to receipt of MS degree); a statistics course at the 6000 level; 2 additional mathematics courses at the 6000 level; NE 6537 (Nuclear Reactor Thermal Hydraulics); NE 7865 (Neutron Slowing Down Theory); and at least one additional advanced nuclear engineering course at the 6000 level or higher.

To the extent that required or comparable courses have been taken by the student prior to entering the PhD program, either at OSU or another institution, the student can petition the Graduate Studies Committee to substitute other courses.

8. *Current and Proposed Advising Sheets*

See Attachment #1.

9. *Curriculum Map*

Not required at this time for graduate program.

10. *Rationale for Program Changes and Description of Changes*

Although structurally there are some significant changes in the program structure, the scope of material provided is very similar, and in some cases enhanced. The majority of courses required for the PhD program are included in the MS program as described in the MS program proposal. In general, the semester courses have been developed by combining quarter courses. The course numbers for the semester program reflect the old quarter numbers from which most of the semester course was developed. Much of the additional requirements beyond the MS degree are associated with higher level mathematics courses. These requirements are essentially unchanged. One of the courses (NE 720) previously required at the PhD level has been incorporated into the reactor dynamics course at the MS level.

Students can be accepted into the PhD program without first obtaining an MS degree or can obtain an MS degree. Although there had previously been an option by which an

MS degree could be obtained by substituting a journal paper for a master's thesis, this option was seldom exercised and would no longer be available for students progressing to a PhD.

11. Credit Hour Changes

Because the PhD requirements are most easily understood as an increment to the MS program requirements, the following table first explains the impact of transition on the MS program. The next table shows the impact of transition on the increment beyond MS requirements. The final table is just the summation of the first two tables, showing the total impact of transition. It does not matter whether the student goes directly from the Bachelor degree to the PhD or by way of the MS degree. The course requirements are the same.

Changes to MS Program

Program credit hour requirements		A). Number of credit hours in current program	B) Calculated result for 2/3rds of current quarter credit hours	C) Number of cr. hours required for proposed program	D. Change in credit hours
Total minimum credit hours required for completion of program		45	30	30	0
Required credit hours offered by the unit	Minimum	36	24	24	0
	Maximum	39	26	27	1
Required credit hours offered outside the unit	Minimum	6	4	3	-1
	Maximum	9	6	6	0

*No graduate credit

Marginal Changes Beyond MS Program

Program credit hour requirements*		A). Number of credit hours in current program	B) Calculated result for 2/3rds of current quarter credit hours	C) Number of cr. hours required for proposed program	D. Change in credit hours
Total minimum credit hours required for completion of program		75	50	50	0
Required credit hours offered by the unit	Minimum	66	44	44	0
	Maximum	66	44	44	0
Required credit hours offered outside the unit	Minimum	9	6	6	0
	Maximum	9	6	6	0

*These numbers are marginal numbers for the PhD program beyond the MS program, which is described in the MS program proposal

Total Changes to PhD Program

Program credit hour requirements		A). Number of credit hours in current program	B) Calculated result for 2/3rds of current quarter credit hours	C) Number of cr. hours required for proposed program	D. Change in credit hours
Total minimum credit hours required for completion of program		120	80	80	0
Required credit hours offered by the unit	Minimum	102	68	65	-3
	Maximum	105	70	71	+1
Required credit hours offered outside the unit	Minimum	15	10	9	-1
	Maximum	18	12	15	+3

*No graduate credit

12. Rationale for Significant Changes in Credit Hours

The changes are not considered significant.

13. Transition Policy

No PhD student who began the program prior to the transition will have progress toward the PhD degree impeded. The NE program does not offer service courses, so only students in the Nuclear Engineering program will be affected. The total credit hours to receive a PhD post-baccalaureate will be 80 credit hours. Credits received prior to the transition will be multiplied by the factor 0.67 in determining the total. In general, a student will be required to have taken a course having the substance of a required

course. It is expected that students will work with their advisors to resolve any issues associated with satisfying post-transition requirements. The Nuclear Engineering Graduate Studies Committee will review and approve any deviations from the program requirements.

14. *Assessment Practices*

Not required at this time.

15. *Assessment Plan on File with OAA*

Not required at this time.

Attachment 1. Advising Sheets

A copy of a current (quarter advising sheet) and a proposed (semester) advising sheet are provided for comparison.

Quarter Advising Sheet

When a student with a bachelor's degree or a master's degree applies to the Graduate School, that student can be accepted on a PhD track or on an MS track. Typically, students are accepted on an MS track, but, if their academic record warrants, they can be accepted on a PhD track. A student on a PhD track can choose to obtain an MS degree on the way toward the PhD degree. When an MS candidate takes the Master's Examination, the Examination Committee recommends whether that student should be permitted to continue on a PhD track.

After completing the majority of his/her course work, NE students must take the Qualifying Examinations. It is recommended that a student take the Qualifying Examination before completing 70 hours of letter graded graduate credit in the program. These Qualifying Examinations are under the jurisdiction of the NEGSC. The exam consists of four part comprehensive written exams covering graduate level nuclear engineering coursework. A student that has passed his/her Qualification Examinations is qualified to continue as a doctoral student and later to take the Candidacy Examinations.

The Candidacy Examination is taken after the student's course work has been completed and the scope of dissertation has been defined. The examination must be completed not later than two quarters before graduation.

Course Requirements.

120 credit hours must be taken following the bachelor's degree. If the student obtains an MS degree, the minimum number of additional credit hours is 75 cr. hr. A student does not need to obtain an MS degree prior to a PhD degree. However, all of the MS course requirements must be completed prior to obtaining the PhD degree. In addition, the students must complete the Math 512 and 571 courses, or equivalent; Statistics 610 or 620; NE 707 (or equivalent), 9 additional mathematics courses at the 600 level; NE 720; NE 737; and NE 865.

After the Dissertation Committee has given preliminary approval of the dissertation, a final oral examination will be given.

Semester Advising Report

When a student with a bachelor's degree or a master's degree applies to the Graduate School, that student can be accepted on a PhD track or on an MS track. Typically, students are accepted on an MS track, but, if their academic record warrants, they can be accepted on a PhD track. A student on a PhD track can choose to obtain an MS degree on the way toward the PhD degree. When an MS candidate takes the Master's Examination, the Examination Committee recommends whether that student should be permitted to continue on a PhD track.

After completing the majority of his/her course work, NE students must take the Qualifying Examinations. It is recommended that a student take the Qualifying Examination before completing 45 hours of letter graded graduate credit in the program. These Qualifying Examinations are under the jurisdiction of the NEGSC. The exam consists of four part comprehensive written exams covering graduate level nuclear engineering coursework. A student that has passed his/her Qualification Examinations is qualified to continue as a doctoral student and later to take the Candidacy Examinations.

The Candidacy Examination is taken after the student's course work has been completed and the scope of dissertation has been defined. The examination must be completed not later than two quarters before graduation.

Course Requirements.

80 credit hours must be taken following the bachelor's degree. If the student obtains an MS degree, the minimum number of additional credit hours is 50 cr. hr. A student does not need to obtain an MS degree prior to a PhD degree. However, all of the MS course requirements must be completed prior to obtaining the PhD degree. In addition, the students must complete 5000 level mathematics courses in the areas of partial differential equations and linear algebra (usually obtained prior to receipt of MS degree); a statistics course at the 6000 level; 2 additional mathematics courses at the 6000 level; NE 6537 (Nuclear Reactor Thermal Hydraulics); NE 7865 (Neutron Slowing Down Theory); and at least one additional advanced nuclear engineering course at the 6000 level or higher.

After the Dissertation Committee has given preliminary approval of the dissertation, a final oral examination will be given.