



College of Engineering

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Date: 9 November 2010

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 Undergraduate Minor in Nuclear Engineering

Attached is a letter from K. (Cheena) Srinivasan, Department Chair of Mechanical and Aerospace Engineering, as well as a semester conversion proposal for their Undergraduate Minor program in Nuclear Engineering.

This 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 it be approved. After a discussion, CCAA unanimously approved the proposal on the 8<sup>th</sup> of November 2010 and requested that I forward the proposal 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, MAE Department Chair  
**Date:** September 15, 2010

**Regarding: Semester Program Proposal for Undergraduate Minor in Nuclear Engineering**

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 nuclear engineering degrees offered:

1. PhD in Nuclear Engineering (a graduate program in Engineering; we will submit a revised program proposal to the Engineering College Committee on Academic Affairs prior to the end of April).
2. MS in Nuclear Engineering (a graduate program in Engineering; we will submit a revised program proposal to the Engineering College Committee on Academic Affairs prior to the end of April).

There are also two non-degree minor programs:

1. Graduate Minor in Radiation 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 undergraduate minor 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.

Signed and Approved:



K. Srinivasan

## **Nuclear Engineering Undergraduate Minor Program**

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

### **1. Name of Program**

Minor in Nuclear Engineering.

### **2. Name of Degree**

No degree is offered.

### **3. Responsible Academic Unit**

Department of Mechanical Engineering.

### **4. Type of Program**

Undergraduate minor 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 undergraduate minor in nuclear engineering are:

1. Graduates with the nuclear engineering minor in combination with their major in another engineering or technical discipline will be attractive candidates for employment in the nuclear industry.
2. Graduates with appropriate aptitude will be attracted to undertake graduate work in nuclear engineering.
3. Graduates will be informed and involved members of their communities, and responsible engineering professionals.

The outcomes of the undergraduate minor in nuclear engineering are that a student will attain:

1. An understanding of the basics of nuclear engineering, reactor physics, radiation protection, nuclear power plant design, and nuclear safety;
2. An ability to work on multi-disciplinary teams;
3. An ability to identify, formulate, and solve engineering problems;

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

## **7. *Proposed Program Requirements***

The undergraduate nuclear engineering minor augments the student's undergraduate major curriculum. The two mandatory courses: 1. Introduction to Nuclear Science and Engineering (3 cr. hr.) and 2. Nuclear Reactor Systems (3 cr. hr.) satisfy the basic elements of the first program outcome. Because of the breadth of the nuclear engineering discipline and its relationship to other disciplines such as Mechanical Engineering, Electrical Engineering, Civil and Environmental Engineering, Engineering Physics, Materials Science and Engineering, and Chemical Engineering, different students will want to take different elective courses that are most appropriate to their interests. A total of 12 cr. hr. is required to complete the minor. See Attachment #2 for a list of elective courses.

## **8. *Current and Proposed Advising Sheets***

See Attachments #1 and #2.

## **9. *Curriculum Map***

The first course that would typically be taken by a minor student is NE 4505, Introduction to Nuclear Science and Engineering. This course can be taken as early as the sophomore year. The other three courses are fit into the student's schedule. The scheduling is driven by the requirements of the student's major program.

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

Within the current program a total of 21 credit hours of nuclear engineering courses are required. Twelve of these credit hours involve required courses: Introduction to Nuclear Science and Engineering, Radiological Safety, Reactor Theory, and Nuclear Reactor Systems. In the revised program, a total of 12 credit hours are required to obtain the

minor. Of these six hours are mandatory. The Introduction to Nuclear Science and Engineering course is being expanded in the area of Reactor Theory and to a lesser extent in the area of Radiological Safety. The other required course is the Nuclear Reactor Systems course. Thus, the program will satisfy the same goals but there will be a slight decrease in the opportunity for the student to experience some of the diverse aspects of nuclear engineering.

### **11. Credit Hour Changes**

As discussed above, the required number of credit hours for completion of the Nuclear Engineering minor will decrease from 21 nuclear engineering credit hours to 12 credit hours. A direct 2/3 reduction would result in fourteen credit hours, which does not fit well with our course offerings. The number of courses/credit hours required for the minor were rounded down rather than up because we have some concern that, in the semester system, students will have less freedom to choose electives.

Program requirements:	No. credit hours in current program	2/3 of Current	Number in Proposed Program
Total for program completion	21	14	12
Prerequisite courses not counted toward total	0	0	0
Required courses/cr.hr. offered by unit	7/21	4.67/14	4/12
Required courses/cr.hr. outside unit	n.a.	n.a.	n.a.

### **12. Rationale for Significant Changes in Credit Hours**

The changes are not considered significant.

### **13. Transition Policy**

No undergraduate minor student who began the program prior to the transition will have progress toward the minor impeded. The total credit hour requirement post-transition will be 12 credit hours. Credits toward the minor received prior to the transition will be multiplied by the factor 0.67 in determining the total. Any graduate with the minor must have taken NE 505 (or NE 4505) and NE 736 (or NE 4536). Students can petition the Nuclear Engineering Graduate Studies Committee to deal with special circumstances that may arise.

### **14. Assessment Practices**

The Nuclear Engineering Program Committee composed of the Nuclear Engineering Faculty and program adjunct professors has the responsibility for the review of the

nuclear engineering minor curriculum. In anticipation of the future adoption of a nuclear engineering major program and the need to satisfy ABET requirements, an assessment plan is being developed to become effective in the 2010/2011 school year.

**15. *Assessment Plan on File with OAA***

None.

## **Attachment 1. Quarter Advising Sheets**

### UNDERGRADUATE MINOR IN NUCLEAR ENGINEERING

The nuclear industry expanded rapidly in the 1960s and early 1970s and during that time hired thousands of engineers and scientists. Now those people are approaching retirement age, and the nuclear industry needs to replace them. Electric utilities, national laboratories, and government regulatory agencies need both nuclear engineers and scientists and engineers in other fields who also have some knowledge of nuclear technology. Because so many senior people are retiring, there will be many opportunities for rapid advancement in the nuclear industry over the next several years. Ohio State now offers an undergraduate minor in Nuclear Engineering to provide students with the knowledge and skills they will need for many entry level positions in the nuclear industry.

The undergraduate minor in Nuclear Engineering requires 4 core courses and 3 additional courses selected from a list of options. Up to 10 hours of courses in the minor may be used as technical electives in some majors. The courses offered in the Nuclear Engineering minor are:

#### **Core**

NE 505 Introduction to Nuclear Science and Engineering (3 credit hours) – AU and SP  
NE 606 Radiological Safety (3 credit hours) – AU  
NE 701 Introduction to Nuclear Power Engineering (3 credit hours) – WI  
NE 736 Nuclear Power Plants (3 credit hours) – WI

#### **Options** (select 3)

NE 610 Reactor Safety I (3 credit hours) – WI  
NE 716 Probabilistic Reliability Safety Analysis (3 credit hours) - SP  
NE 720 Reactor Dynamics and Control (3 credit hours) – AU  
NE 735 Power Plant Operations I (3 credit hours) – WI  
NE 737 Heat Transfer Applications in Nuclear Reactor Systems (3 credit hours)- SP  
NE 742 Nuclear Radiations and Their Measurement (3 credit hours) – WI  
NE 743 Nuclear Radiations and Their Shielding (3 credit hours) - SP  
NE 745 Power Plant Operations II (3 credit hours) – SP  
NE 771 Radioactive Waste Management (3 credit hours) - AU  
NE 776 Nuclear Fuel Cycles (3 credit hours) – AU

#### Registering for the Nuclear Engineering Minor Program

If you are interested in pursuing the undergraduate minor in Nuclear Engineering, simply complete the [Minor Program Form](#) which is available in the College Office (Room 122 Hitchcock Hall) or <http://engineering.osu.edu/academic/degreeprograms.ams/pdf/MinorProgramForm.pdf> (follow the steps on the College of engineering website: Minors – Minor Program Form. List the Nuclear Engineering courses you plan to take and the quarter and year in which you plan to take them. The [Minor Program Form](#) is not binding and does not commit you to taking the courses in the quarters you indicate. It simply informs us that you plan to participate in the Nuclear Engineering Minor program and helps us to plan our teaching loads.

After you complete the Minor Program Form, please bring it to, E406, 201 West 19<sup>th</sup> Avenue. If you have questions about the Minor in Nuclear Engineering, please contact Grace Hines, ([Hines.7@osu.edu](mailto:Hines.7@osu.edu)) or 292-8519.

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## **Attachment 2. Semester Advising Sheets**

### UNDERGRADUATE MINOR IN NUCLEAR ENGINEERING

The nuclear industry expanded rapidly in the 1960s and early 1970s and during that time hired thousands of engineers and scientists. Now those people are approaching retirement age, and the nuclear industry needs to replace them. In addition, a number of new power plant applications are in various stages of review by the Nuclear Regulatory Commission. Electric utilities, national laboratories, and government regulatory agencies need both nuclear engineers and scientists and engineers in other fields who also have some knowledge of nuclear technology. Because so many senior people are retiring, there will be many opportunities for rapid advancement in the nuclear industry over the next several years. Ohio State now offers an undergraduate Minor in Nuclear Engineering to provide students with the knowledge and skills they will need for many entry level positions in the nuclear industry.

The undergraduate Minor in Nuclear Engineering requires 2 core courses and 2 additional courses selected from a list of options. The courses offered in the Nuclear Engineering minor are:

#### **Core**

			Credit Hours	Semester Offered
NE	4505	Introduction to Nuclear Science and engineering	3	AU & SP
NE	4536	Nuclear Reactor Systems	3	SP

#### **Options (select 2)**

NE	5606	Radiological Safety	3	AU
NE	5610	Reactor Safety	3	SP
NE	5716	Probabilistic Risk Assessment	3	AU
NE	5776	Radioactive Waste Management/Nuclear Fuel Cycles	3	AU
NE	5742	Nuclear Radiations and Their Detection	3	SP
NE	5735	Power Plant Operations	3	SP
NE	6537	Nuclear Reactor Thermal Hydraulics*	3	AU
NE	6708	Reactor Theory*	3	AU
NE	6725	Reactor Dynamics*	2	SP
NE	6726	Reactor Dynamics Laboratory*	2	Mini-mester

\*With permission of instructor. If NE 6725 and NE 6726 are selected and approved, the student needs to take a total of five courses to satisfy the minimum requirement of 12 cr. hr.



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After you complete the Minor Program Form, please bring it to Room E406 Scott Lab, 201 West 19<sup>th</sup> Avenue for a signature of the faculty advisor for the minor program. If you have questions about the Minor in Nuclear Engineering, please contact Prof. Tunc Aldemir, Chair of the Nuclear Engineering Program, by e-mail at [Aldemir.1@osu.edu](mailto:Aldemir.1@osu.edu) or by phone at 292-4627.