MS Nucl Engin
Master of Science in Nuclear Engineering

Draft | Fall 2023

Proposal Information

Status
Active

Workflow Status
Proposal not yet submitted for approval.

Changes

- Program Description
- Degree Hours
- Concentration Required
- Emphasis required
- Admissions Requirements

Show All

Proposal Information

Proposed
Sponsoring faculty/staff member
Adam Hecht

Proposed
Sponsoring faculty/staff email
hecht@unm.edu

Existing
Sponsoring faculty/staff member

Existing
Sponsoring faculty/staff email

College
School of Engineering

Department
Nuclear Engineering

Campus
Main Campus

Effective Term and Year

Proposed
Proposed Effective Term and Year
Fall 2023

Existing
Proposed Effective Term and Year
Fall 2006

Justification

Proposed

Program Justification

Previously listed core courses are not taught consistently for graduate students, so to avoid multiple memos providing exceptions for other courses to count, the faculty voted to remove the choose two from this list. NE 525 was already an approved core course but didn't transfer over correctly to this new system and should have been listed; we would like to keep this course for our NE core requirements for MS Plan I and III and PhD. Updated the hours requirements for MS Plan II (27 hours of coursework, 6 hours of practicum, NE 501 is not required) after consulting with Dr. Hecht.
Adding catalog updates 3/23. - hts

Existing

Program Justification

Associated Forms

Select any associated course forms that exist

Select any associated program forms that exist

Program Category and Level

Program Category
Program

Program Level
Graduate

Degree, Minor, or Certificate Name
Master of Science in Nuclear Engineering

Proposed
New Graduate Program
No

Dual Degree
No

Proposed
New Undergrad Degree/Certificate
No

Existing
New Graduate Program
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Existing
New Undergrad Degree/Certificate
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Catalog Information

Proposed

Program Description

Information

The nuclear engineering research graduate programs at the University of New Mexico include nuclear criticality safety, radiation transport, reactor theory, single and two-phase flow in microgravity, space nuclear power, thermal-hydraulics, fusion energy, accelerator physics and engineering, occupational and environmental radiation protection, plasma physics, nuclear activation diagnostics, high energy density physics, reactor and shielding design, nuclear fuel irradiation behavior, theoretical and numerical methods in neutral and stochastic transport theory, charged particle transport, model-reference adaptive control of nuclear power plants, heat pipes for space application, computational methods for heat transfer and fluid flows, single phase laminar and combined flows, two-phase flows and probabilistic risk assessment.

The nuclear engineering laboratories are equipped with an AGN-201M nuclear training reactor; a hot cell facility with remote manipulators; a graphite pile; several solid-state detectors for alpha, beta and gamma radiation; computer-based data acquisition, analysis and control systems; and supporting radiation measurements systems. In addition to the well-equipped laboratories on campus, the advanced reactors and radiation equipment of Sandia National Laboratories, Los Alamos National Laboratory, Lovelace Respiratory Research Institute, and the Air Force Research Laboratory are utilized for instruction and research. The laboratories provide not only experimental facilities but access to high-performance supercomputers for carrying on advanced computational physics.

The department maintains a computer pod for student use, equipped with PCs with a wide selection of software.

Additional information on programs and facilities may be obtained by contacting either the graduate advisor or the department chairperson.

Master of Science in Nuclear Engineering

The Master of Science (M.S.) in Nuclear Engineering is a “traditional” nuclear engineering program. Graduates in engineering or science from any recognized college or university may apply for admission to graduate study in nuclear engineering. Students planning to do graduate work in nuclear engineering should focus on physics, mathematics and nuclear engineering in their undergraduate coursework in addition to acquiring competence in one of the branches of engineering or science. Undergraduate coursework in the following is recommended: atomic and nuclear physics, advanced applied mathematics, computer programming, thermodynamics and heat transfer, fluid mechanics, principles of circuits, materials science, nuclear measurements, reactor physics, and instrumentation.

A GPA of 3.0 in the last two years of undergraduate study, and/or in previous engineering graduate study, is normally required for admission. In addition, the GRE is required of all Nuclear Engineering applicants.
The M.S. is offered under **Plan I**, **Plan II**, and **Plan III** options.

- Plan I (thesis) requires 30 credit hours with 24 credit hours of coursework and 6 credit hours of thesis. Of the 24 credit hours of coursework, a minimum of 9 credit hours is required at the 500-level with a maximum of 3 credit hours in problems courses.
- Plan II (non-thesis) requires 33 credit hours of coursework including a maximum of 6 credit hours for problems courses and a minimum of 12 credit hours in 500-level courses. Completion of a Master's project under the direction of a faculty member is also required.
- Plan III (coursework only) requires 30 credit hours of coursework including a maximum of 6 credit hours of problems courses.

A program that allows the Plan II to be completed in one calendar year is also offered. This program should be requested at the time of application and should begin in the summer or fall semester. The program typically includes a course load of 14 credit hours in the fall semester (two core courses, two electives and graduate seminar), 13 credit hours in the spring

Proposed

Admissions Requirements

Students who do not have a background in nuclear reactor theory are also required to take NE 410/510 Nuclear Reactor Theory (NE 410 must be a B or better). Students with undergraduate degree fields other than nuclear engineering may be required to take certain undergraduate background courses determined by the graduate advisor. See department website for more information.

All candidates for the M.S. degree must satisfactorily pass a final examination which emphasizes the fundamental

Existing

Admissions Requirements

A GPA of 3.0 in the last two years of undergraduate study, and/or in previous engineering graduate study, is normally required for admission. In addition, the GRE is required of all Nuclear Engineering applicants.

Proposed

Graduation Requirements

Plan I

- All candidates for this plan must satisfactorily pass a final examination which emphasizes the fundamental principles and applications of nuclear engineering. This examination is normally the thesis defense for Plan I students. The examination is conducted by a committee of at least three faculty members. This committee is formed in consultation with the student's research advisor or project advisor and is approved by the Department Chairperson.

Plan II

- All candidates for this plan must satisfactorily pass a final examination which emphasizes the fundamental principles and applications of nuclear engineering. This examination is normally based on a short-term project (Practicum) for Plan II students, including those in the one-year program. The examination is conducted by a committee of at least three faculty members. This committee is formed in consultation with the student's research advisor or project advisor and is approved by the Department Chairperson.

Plan III

- Successful completion of required coursework.

Additional information on graduation requirements can be found at the UNM Graduate Studies website.

Existing

Graduation Requirements

Program Information

Degree Type

Master of Science

Degree/Certificate Type	CIP Code	CIP Title
Graduate	14.2201	Nuclear Engineering

Plan Options

Plan I (Thesis)
Plan II (Non-thesis)
Plan III (Coursework only)

The nuclear engineering research graduate programs at the University of New Mexico include nuclear criticality safety, radiation transport, reactor theory, single and two-phase flow in microgravity, space nuclear power, thermal-hydraulics, fusion energy, accelerator physics and engineering, occupational and environmental radiation protection, plasma physics, nuclear activation diagnostics, high energy density physics, reactor and shielding design, nuclear fuel irradiation behavior, theoretical and numerical methods in neutral and stochastic transport theory, charged particle transport, model-reference adaptive control of nuclear power plants, heat pipes for space application, computational methods for heat transfer and fluid flows, single phase laminar and combined flows, two-phase flows and probabilistic risk assessment. The nuclear engineering laboratories are equipped with an AGN-201M nuclear training reactor; a hot cell facility with remote manipulators; a graphite pile; several solid-state detectors for alpha, beta and gamma radiation; computer-based data acquisition, analysis and control systems; and supporting radiation measurements systems. In addition to the well equipped laboratories on campus, the advanced reactors and radiation equipment of Sandia National Laboratories, Los Alamos National Laboratory, Lovelace Respiratory Research Institute, and the Air Force Research Laboratory are utilized for instruction and research. The

Professional Credential/Licensure Program Information

Proposed

Licensure Information

Neither

advisor or the department chairperson. The Master of Science (M.S.) in Nuclear Engineering is a “traditional” nuclear

Existing

Licensure Information

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of the branches of engineering or science. Undergraduate coursework in the following is recommended: atomic and nuclear physics, advanced applied mathematics, computer programming, thermodynamics and heat transfer, fluid mechanics, principles of circuits, materials science, nuclear measurements, reactor physics, and instrumentation.

File Uploads

Proposal File Upload	Executive Summary Upload	Associate Provost Memo

Degree Information

Proposed

Degree Hours

30 - 34

Minimum Major Hours

Existing

Degree Hours

30 - 33

Professional Accrediting Bodies

Degree Requirements

Requirements

- Complete 1 of the following

Plan I (Thesis)

- Complete all of the following
  - Earn at least 3 credits from the following:
    - NE501 - Nuclear Engineering Seminar (1)
  - Complete the following:
    - NE525 - Methods of Analysis in Chemical, Biological, and Nuclear Engineering (3)
  - ~~Complete at least 2 of the following:~~
    - ~~NE511 - Advanced Nuclear Reactor Theory (3)~~
    - ~~NE520 - Radiation Interactions and Transport (3)~~
    - ~~NE524 - Interaction of Radiation with Matter (3)~~
    - ~~NE562 - Monte Carlo Techniques for Nuclear Systems (3)~~
    - ~~NE571 - Radiation Damage in Materials (3)~~
  - Earn at least 6 credits from the following:
    - ~~ME599 - Master's Thesis (1 - 6)~~
    - **NE599 - Master's Thesis (1 - 6)**
  - Earn at least ~~12~~ **18** credits from the following types of courses:
    Electives~~. Of the 24 credit hours of coursework, a minimum of 9 credit hours is required at the 500-level with a maximum of 3 credit hours in problems courses.~~
- **Of the 24 credit hours of coursework required for Plan 1, a minimum of 9 credit hours is required at the 500-level. No more than 3 credit hours in problems courses may count toward the degree.**

Plan II (Non-Thesis)

- Complete all of the following
  - ~~Earn at least 3 credits from the following:~~
    - ~~NE501 - Nuclear Engineering Seminar (1)~~
  - Complete the following:
    - ~~NE525 - Methods of Analysis in Chemical, Biological, and Nuclear Engineering (3)~~
    - **NE523L - Environmental Measurements Laboratory (1 - 4)**
    - **NE524 - Interaction of Radiation with Matter (3)**
    - **NE528 - External Radiation Dosimetry (3)**
    - **NE529 - Internal Radiation Dosimetry (3)**
    - **NE527 - Radiation Biology for Engineers and Scientists (3)**
  - ~~Complete at least 2 of the following:~~
    - ~~NE511 - Advanced Nuclear Reactor Theory (3)~~
    - ~~NE520 - Radiation Interactions and Transport (3)~~
    - ~~NE524 - Interaction of Radiation with Matter (3)~~
    - ~~NE564 - Thermal-Hydraulics of Nuclear Systems (3)~~
    - ~~NE562 - Monte Carlo Techniques for Nuclear Systems (3)~~
  - **Earn at least 6 credits from the following:**
    - **NE591 - Practicum (3 - 6)**
  - Earn at least ~~21~~ **12** credits from the following types of courses:
    Electives~~:~~**.** ~~requires~~**These** ~~33~~**electives** ~~credit~~**are** ~~hours~~**chosen** ~~of~~**from** ~~coursework~~**areas** ~~including a maximum of~~ ~~6~~**interest** ~~credits~~**such** ~~hours~~**as** ~~for~~**waste** ~~problems~~**management,** ~~courses~~**nuclear** ~~and~~**power,** ~~a~~**or** ~~minimum~~**calculational** ~~of 12 credit hours in 500-level courses~~**methods**~~. Completion of a Master's project under the direction of a faculty member is also required.~~
- **Completion of a Master's project (NE 591 - Practicum) under the direction of a faculty member is also**

required.

Plan III (Coursework)

- Complete all of the following
  - Earn at least 3 credits from the following:
    - NE501 - Nuclear Engineering Seminar (1)
  - Complete the following:
    - NE525 - Methods of Analysis in Chemical, Biological, and Nuclear Engineering (3)
  - ~~Complete at least 2 of the following:~~
    - ~~NE511 - Advanced Nuclear Reactor Theory (3)~~
    - ~~NE520 - Radiation Interactions and Transport (3)~~
    - ~~NE571 - Radiation Damage in Materials (3)~~
    - ~~NE562 - Monte Carlo Techniques for Nuclear Systems (3)~~
    - ~~NE571 - Radiation Damage in Materials (3)~~
  - Earn at least ~~18~~ **24** credits from the following types of courses:
    Electives~~: requires 30 credit hours of coursework including a maximum of 6 credit hours of problems courses.~~
- **Plan III requires 30 credit hours of coursework (no more than 6 credit hours of problems courses may count toward the degree).**

Grand Total Credits: 30 - 34

Concentrations

Program Concentrations

Code	Title
CON Entrep Tech Mgmt Nuc Engr	Entrepreneurship and Technology Management
CON Rad Protect Engr	Radiation Protection Engineering
CON Med Phys	Medical Physics

Proposed
Concentration Required
No

Existing
Concentration Required
Yes

Emphases

Proposed

Emphasis required

N/A

Emphasis Hours

Existing

Emphasis required

No

Emphasis Rules

No Rules

Program Learning Outcomes

Proposed

Learning Outcomes

- Demonstrate knowledge of engineering and science fundamentals appropriate for the discipline and specialization.
- Demonstrate depth of knowledge in their specialization.
- Demonstrate the ability to conduct original and independent research.
- Demonstrate the ability to perform critical review of literature in their area of specialization.
- Be able to communicate effectively.

Existing

Learning Outcomes