THE UNIVERSITY OF NEW MEXICO

Nuclear Engineering

Academic Program Review

2017 - 2018

School of Engineering

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Criterion 0. Introductory Section and Background Information

0A. Executive Summary

An Executive Summary that provides a one to two-page summary/abstract of the information contained within the Self-Study Report.

The Department of Nuclear Engineering has its roots in an undergraduate Department of Chemical Engineering founded in 1946, and a graduate Department of Nuclear Engineering founded in 1965. The departments were administratively combined in 1972, and then separated in July 2014. The Department of Nuclear Engineering resides in the School of Engineering of the University of New Mexico. Currently there are 7 regular faculty members (tenured, tenure- track, and lecturer) and 2 full-time staff members, with a new faculty member expected to join the department in Fall 2018. In Fall 2017 student enrollments at the BS, MS and PhD degree levels were 94, 16, and 30, respectively. The undergraduate program is accredited by ABET (Accreditation Board for Engineering and Technology). Departmental faculty are active in research, with expenditures totaling about $1.34 million per year. Research areas span a wide spectrum that include nuclear thermal-hydraulics, nuclear materials and fuels, radiation transport, nuclear non-proliferation, space nuclear power, and criticality safety.

This self-study report documents all academic aspects of the department operation. It starts with a brief history, the organization structure, and the most recent accreditation review and previous Academic Program Review. The program objectives and student learning outcomes are described next. For the undergraduate degree, ABET-specified learning outcomes are followed. The School of Engineering has a common set of graduate outcomes for all its programs. The BS degree in Nuclear Engineering requires a total of 124 credit hours, which include the university core courses, math and basic sciences, and engineering topics. We have three required hands-on undergraduate nuclear engineering laboratory courses. We seek to graduate students who are capable of making decisions, analyzing alternatives, and creating integrated designs that are solutions to engineering problems with economic and political constraints. To help achieve this we have integrated design into our courses, from the sophomore through senior year. Our philosophy for design is to expose the student to a variety of design topics representative of the types of assignments they may expect in an industrial setting. We feel they should be given exposure to modern computational and design tools and that they should have experience working in groups as well as individually.

There are three options for the MS degree – thesis, project and coursework only, requiring, respectively, 30, 34 and 30 credit hours. The PhD degree requires 48 credit hours beyond the BS level, as well as passing the Comprehensive Exam and the PhD Exam in the form of a dissertation defense.

Assessment of student outcomes is largely dictated by the ABET accreditation process for the undergraduate program. Questions for assignments/exams and project performance are selected by the faculty to assess specific outcomes, following the assessment rubric. The results of these activities are discussed by departmental faculty and used to make continuous improvement to the program. Graduate level assessment is conducted by the student’s thesis/project/dissertation committee, following the rubric developed by School of Engineering.

The Engineering Student Success (ESS) Center, under the School of Engineering, coordinates the recruitment of undergraduate students. Those who declared Nuclear Engineering as their pre-major may be admitted to the program as majors, after completing 18 credit hours of freshman level technical subjects with a minimum grade-point average of 2.75. Graduate admission is based on the applicant's academic records, test scores, and letters of recommendation. A wide range of academic support is provided by the university and at the departmental level. Nuclear Engineering students are advised by the faculty as well as professional advisement staff. During the 2016-2017 academic year, the department awarded 13 BS degrees, 4 MS degrees, and 6 PhD degrees.

Currently the regular departmental faculty consists of 2 Distinguished Professors, 1 Full Professor, 1 Associate Professor, 2 Assistant Professors and 1 Lecturer III. A new Assistant Professor is expected to start in Fall 2018. All faculty members contribute to undergraduate and graduate teaching, and most have active research programs. Consistent with the School of Engineering Academic Load Policy, faculty teach between 3 and 4 courses per year, depending on their level of research funding and number of graduate students they are supervising. The department encourages every faculty to have a balanced teaching responsibility at undergraduate and graduate levels.

The department's revenue sources consist of $1.1 million direct Instruction & General (I&G) funds annually, course fees and differential tuition at both undergraduate and graduate levels. Research related activities are supported through external funding, primarily from federal agencies and national laboratories. NE faculty have dedicated research laboratory space in the basement of Centennial Engineering Center (3000 sq. ft.), the Mechanical Engineering building (980 sq. ft.), and the Nuclear Engineering Laboratory (4170 sq. ft.). Additional space for growth is available in principle in the basement of the newly renovated Farris Engineering Center but funding must be raised from external sources to make the space useable. This self-study report concludes with a comparison with Nuclear Engineering departments in some of our peer institutions, focusing on the faculty and student counts along with national ranking.

0B. History

A brief description of the history of each degree/certificate program offered by the unit.

The history of nuclear engineering began when Glenn Whan joined the chemical engineering faculty at the beginning of 1957. After two and a half years, Glenn took a leave of absence to interact with the Los Alamos National Laboratory. The decision to begin the Nuclear Laboratory was made by Dean Farris, and in January 1960 Glenn Whan returned from his leave as the head of the Nuclear Laboratory reporting directly to the Dean. The nuclear program began offering graduate degrees in nuclear engineering and was returned to the Chemical Engineering Department in the 1962-63 academic year as a special graduate division. In April 1965 the UNM faculty authorized the Department of Nuclear Engineering as a graduate department, and Glenn Whan was appointed Chair.

The next significant development took place in the early 1970s. The nuclear engineering program had a relatively small number of graduate students and the chemical engineering program was likewise small and comprised predominantly of undergraduate students. In Spring of 1972, Dean Dove combined the two departments for administrative efficiency and created the Department of Chemical and Nuclear Engineering with Glenn Whan as Chair.

In 1981 the bachelor's degree curriculum in nuclear engineering was approved by the faculty of the College of Engineering, and the first BSNE was granted during the 1981-82 school year. ABET accreditation was received in 1986. Currently student enrollments at the BS, MS and PhD degree levels are 94, 16, and 30, respectively. Since the creation of the standalone Department of Nuclear Engineering in 2014, the department had awarded a total of 52 BS degrees, 32 MS degrees, and 16 PhD degrees.

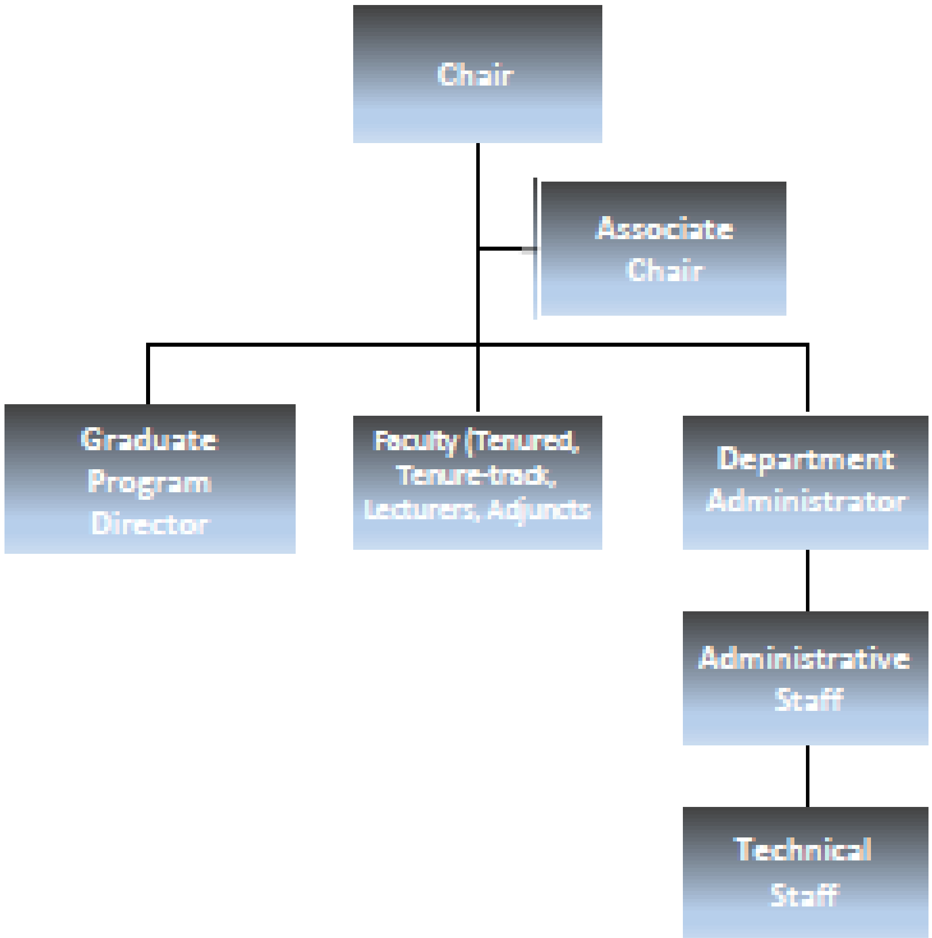
A masters-level concentration in Radiation Protection Engineering was started in 1990. The concentration is intended to train personnel to work in the area of occupational and environmental health physics. In recent years the annual degree production averaged around 3.

Office facilities and student meeting rooms are in the newly renovated Farris Engineering Center. The nuclear engineering teaching laboratory is 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. There are no classrooms specifically dedicated to the department, and none available within the Farris Engineering Center building. The university has a process for scheduling classrooms that generally works well, and most classes are scheduled in adequate rooms in adjacent buildings (normally the Mechanical Engineering building or the Centennial Engineering Center). Nevertheless, classroom scheduling is very tight across the university, and classes must occasionally be scheduled in buildings at some distance from Farris. The department has scheduling control over one seminar room, and two other seminar rooms are accessible in Farris. A large conference room and computer lab on the second floor of Farris is shared with the Chemical and Biological Engineering Department.

0C. Organizational Structure and Governance

A brief description of the organizational structure and governance of the unit, including a diagram of the organizational structure.

The leadership of the Department of Nuclear Engineering consists of a Department Chair, who is appointed by the Dean, and one Associate Chair who is appointed by the Chair and approved by the Dean. The Department Chair appoints the Director of the Graduate and Undergraduate Committees and the faculty collectively determine membership of the Committees. The department practices shared faculty governance with all decisions affecting the department voted on by the entire faculty. The organizational structure is shown in the diagram below.



0D. Specialized and/or External Accreditations

Information regarding specialized/external program accreditation(s) associated with the unit, including a summary of findings from the last review, if applicable. If not applicable, indicate that the unit does not have any specialized/external program accreditation(s).

There is no accrediting body for the graduate programs in the Department of Nuclear Engineering. Our undergraduate program, on the other hand, is accredited by the Engineering Accreditation Commission of ABET (Accreditation Board for Engineering and Technology).

The ABET visit normally takes place once every 6 years. The most recent visit was in Fall of 2016. The final report was received in August 2017. The "Summary of Accreditation Actions" stated that Nuclear Engineering (BS) is "Accredited to September 30, 2023. A request to ABET by January 31, 2022 will be required to initiate a reaccreditation evaluation visit. In preparation for the visit, a Self-Study Report must be submitted to ABET by July 01, 2022. The reaccreditation evaluation will be a comprehensive general review." The "Final Statement of Accreditation" is shown below.

Nuclear Engineering BS Program

Program Criteria for Nuclear, Radiological, and Similarly Named Engineering Programs

Introduction

The nuclear engineering BS program was administered with the chemical engineering program in one department until 2014 when it moved to a separate department. The nuclear engineering program has 78 full-time students and 12 pru.1-time students. The program is served by eight faculty members, and one lecturer: with two faculty members recently joining the program in fall 2016. The program graduated 16 students in the 2015-16 academic year.

Program Strength

1. The program possesses exceptional and unique facilities such as the AGN nuclear training reactor, hot-cell, and graphite pile. These facilities provide an outstanding learning enrichment for the students in the program.

Program Concern

1. Criterion 4. Continuous Improvement This criterion requires a program to regularly use appropriate, documented processes for assessing and evaluating the extent to which the student outcomes are being attained. The results of these evaluations must be systematically utilized as input for the continuous improvement of the program. At present the assessment and continuous improvement process is mainly driven by one non-tenure track faculty member who will be retiring within a year. While the criterion is currently satisfied, the sustainability of the assessment and continuous improvement process is uncertain, which may jeopardize future compliance with the criterion.

30-day due-process response: The EAC acknowledges receipt of documentation stating that the program has strengthened its assessment process and leadership by forming a committee of three faculty members who will oversee the process and assure that other faculty are prepared to step into a future leadership role. In addition, the university has hired a university assessment coordinator who reports to the provost, strengthening campus-wide assessment and annual reporting.

Program Observation

1. The program has an excellent opportunity to diversify the areas of senior design projects by taking advantage of the expertise of current faculty in different areas of nuclear engineering, the unique onsite AGN reactor, and the close proximity to the Los Alamos National Laboratory and Sandia National Laboratory.

0E. Overview of Previous Academic Program Review

A brief description of the previous Academic Program Review Process for the unit. The description should:

- *note when the last review was conducted;*
- *provide a summary of the findings from the Review Team Report;*
- *indicate how the Unit Response Report and Initial Action Plan addressed the findings; and*
- *provide a summary of actions taken in response to the previous APR.*

The Department went through its last APR on April 27-29, 2009 as part of the Chemical Nuclear Engineering Review. The review committee for both programs consisted of Profs. Steven Cramer (Rensselaer Polytechnic Institute), John Falconer (University of Colorado), Barry Ganapol (University of Arizona), Kerry Howe (UNM, Civil Engineering), and Andrew Klein (Oregon State University). The summary of findings, departmental response (back in 2009), and actions/updates (through the present time, 2017) are listed below.

While the APR team was very impressed with the Department, several challenges were identified during the visit that the department should address to improve its undergraduate and graduate programs. First, a balance must be established between enabling the centers to thrive, and simultaneously, maintaining a vibrant department. The department budget, aside from salaries, has shrunk dramatically in the last few years to the point where it is difficult to see how the department can function, much less provide a quality education. This is due to a number of policy decisions, including the F&A split between centers and the department. The F&A apportionment is critical and must be addressed. Although the centers are an integral part of the department, they have created a culture where “Let’s Make a Deal” appears to have become the operational standard in the departmental and university negotiations. This culture has led to an appearance of separation between the elite faculty and center directors and the other faculty in the department. Further, this has created the potential for scenarios where individuals may have a tendency to consider themselves above the organizational structure of the department.

The department needs to devote significantly more effort and resources to graduate recruiting. The departmental advisory board has not met since 2004 and we strongly suggest that this board meet on a more regular basis for ABET accreditation and for facilitating ongoing improvements in the department. The department currently does not have a strategic plan and the faculty needs to develop one that has a clear focus, goals, set of priorities, and establishes a common “branding” for the department. The process of establishing a strategic plan, possibly through a long overdue departmental retreat, will also help to create more cohesion within the department and will assure that all faculty members are “on board” with a commonly accepted plan.

A consistent faculty-mentoring program across the entire department is lacking. A department mentoring program including both direct and indirect mentoring, with accountability, should be instituted.

Finding 1: *The practice of offering every required course every term drives a significant fraction of the teaching requirements and it hampers the development of a coherent graduate curriculum.*

Response (2009): The Department will revisit the issue along with the faculty teaching load.

Update (2017): For three years (2012-2015) the Department implemented a reduced course offering frequency for most of the undergraduate required courses. However, due to a variety of reasons (inability to accommodate too many laboratory sections, insufficient number of large classrooms on campus, new faculty teaching load policy set by the School of Engineering etc.) the Department turned back to offering most required undergraduate courses in both Fall and Spring.

Finding 2: *There is a pressing need to bolster the PhD enrolment, which directly influence rankings and to address the current imbalance between MS and PhD enrolments. A reasonable target would be that the research active faculty ought to have at least 2-3 PhD students.*

Response (2009): The balance between MS and PhD students is beginning to shift as the department is offering a stronger research program. However, the department does not have the resources to “lock in” sufficient well qualified PhD students.

Criterion 1. Student Learning Goals and Outcomes

The unit should have stated student learning goals and outcomes for each degree/certificate program and demonstrate how the goals align with the vision and mission of the unit and university. (Differentiate for each undergraduate and graduate degree and certificate program offered by the unit.)

1A. Vision and Mission

Provide a brief overview of the vision and mission of the unit and how each offered degree/certificate program addresses the vision and mission of the unit.

The school of Engineering sets the common mission and vision for all its departments: The Mission

The mission of the School of Engineering (SOE) at the University of New Mexico is to educate students in engineering and computer science to contribute to the social, technological, and economic development of our state, nation, and global community. We offer a superior education in engineering and computer science in an environment that fosters teamwork, cultural and intellectual diversity, a strong sense of public responsibility, and lifelong learning.

The Vision

The School of Engineering at the University of New Mexico offers broad access to high-quality research-based education by:

- Creating and communicating knowledge through outstanding educational programs that promote learning by uniting teaching and research,
- Recognizing and utilizing cultural and intellectual diversity as creative forces that underlie and enable excellence in engineering and computer science, and
- Stimulating and engaging the School's programs to advance economic development and address critical technological challenges for New Mexico, the nation, and the global economy.

The forward-looking integration of these elements will place the School among the nation's leading comprehensive public engineering colleges.

1B. Relationship between the Unit and University's Vision and Mission

Describe the relationship of the unit's vision and mission to UNM's vision and mission. In other words, to assist the university in better showcasing your unit, please explain the importance of its contribution to the wellbeing of the university, including the impact of the unit's degree/certificate program(s) on relevant disciplines/fields, locally, regionally, nationally, and/or internationally.

University Vision Statement

UNM will build on its strategic resources:

- to offer New Mexicans access to a comprehensive array of high quality educational, research, and service programs,
- to serve as a significant knowledge resource for New Mexico, the nation, and the world; and
- to foster programs of international prominence that will place UNM among America's most distinguished public research universities.

University Mission

The University will engage students, faculty, and staff in its comprehensive educational, research, and service programs.

- UNM will provide students the values, habits of mind, knowledge, and skills that they need to be enlightened citizens, to contribute to the state and national economies, and to lead satisfying lives.
- Faculty, staff, and students create, apply, and disseminate new knowledge and creative works; they provide services that enhance New Mexicans' quality of life and promote economic development; and they advance our understanding of the world, its peoples, and cultures.
- Building on its educational, research, and creative resources, the University provides services directly to the City and State, including health care, social services, policy studies, commercialization of inventions, and cultural events.

The School of Engineering's vision and mission and the University's are in alignment.

The impact of the unit's degree program is consistent with the SOE mission that emphasizes teamwork, cultural and intellectual diversity, public responsibility, lifelong learning and the contributions to social, technological, and economic development from local to global scales.

1C. Unit Goals and Student Learning Outcomes

List the overall program goals and student learning outcomes for each degree/certificate program within the unit. Include an explanation of how they are current and relevant to the associated discipline/field. In accordance with the Higher Learning Commission's criteria for accreditation, student learning goals and outcomes should be articulated and differentiated for each undergraduate and graduate degree and post-graduate and certificate program.

Consistent with the vision and mission of SOE, the Department of Nuclear Engineering sets the following educational objectives for the undergraduate program:

- Graduates will have the educational background necessary to compete successfully in a global workplace

- Qualified graduates will pursue advanced study if desired
- Graduates will pursue leadership positions in their profession and/or communities

The graduate program objectives are largely the same as the undergraduate program, with the added emphasis on a vibrant research agenda to advance fundamental knowledge in mechanical engineering through professionally recognized scholarship.

<u>Student Learning Outcomes (B.S. in Nuclear Engineering)</u>

By the time our graduates complete the mechanical engineering program, they will have successfully demonstrated the following:

a. An ability to apply knowledge of mathematics, science and engineering.
b. An ability to design and conduct experiments, and analyze and interpret data.
c. An ability to design processes, systems or components to meet desired needs and subject to realistic constraints, such as economic, environmental, social, political, ethical, health, safety, manufacturability, and sustainability.
d. An ability to function on multidisciplinary teams.
e. An ability to identify, formulate and solve engineering problems.
f. An understanding of the professional and ethical responsibilities of engineers.
g. An ability to communicate effectively.
h. An understanding of the global, economic, environmental and societal impacts of engineering activities.
i. A recognition of the need for lifelong learning and awareness of how this can be achieved in their subsequent career.
j. A knowledge of contemporary issues.
k. An ability to use modern techniques, skills and engineering tools to address problems encountered in engineering practice.
l. Student Learning Outcomes (M.S. in Nuclear Engineering)

Students receiving the M.S. degree will:

1. Exhibit knowledge of engineering and science fundamentals appropriate for the Nuclear Engineering discipline and/or specialization.
2. Be able to communicate effectively.
3. Demonstrate the ability to critically assess information in the Nuclear Engineering discipline and/or specialization.

Student Learning Outcomes (Ph.D. in Nuclear Engineering) Students receiving the PhD degree will:

1. Exhibit knowledge of engineering and science fundamentals appropriate for the Nuclear Engineering discipline and/or specialization.
2. Demonstrate a depth of knowledge in the specialization.
3. Have the ability to conduct original research.
4. Have demonstrated the ability to perform a critical review of the literature in the area of specialization.
5. Be able to communicate effectively.

1D. Constituents and Stakeholders

Describe the unit's primary constituents and stakeholders. Include an explanation of: (1) how the student learning goals and outcomes for each degree/certificate program are communicated to students, constituents, and other stakeholders; and (2) how satisfaction of the student learning goals and outcomes for each degree/certificate program would serve and support students' academic and/or professional aspirations. Provide specific examples.

The constituents of the Department are its students, faculty and staff. Other primary stakeholders include School of Engineering, the Advisory Council of the Department, our alumni, employers of our graduates, and Graduate and Professional schools where our graduates seek higher degrees. The program objectives and student outcomes are posted on the departmental webpages. The outcomes are set by ABET (undergraduate) and the School of Engineering (graduate). The program objectives are set by faculty and adopted after discussion with the NE Advisory Council. The most recent example is the Advisory Council meeting on January 30, 2018, where the Council endorsed our current program objectives.

Satisfaction of student learning goals and outcomes can be directly correlated to student success. As an example, students present Senior Capstone Designs, as well as results from research projects undertaken as part of an Undergraduate Research Experience and Senior Honors Thesis, at the annual ANS Student Conferences and routinely win best paper and/or best presentation awards. The visibility resulting from their success frequently leads to offers from graduate schools and positions them for competitive merit based scholarships. Sustained undergraduate and graduate internship offers from Sandia National Labs and Los Alamos National Lab provide additional evidence of student success that follows from achievement of outcomes. A significant number of our B.S. degree graduates go on to pursue graduate studies at UNM as well as highly ranked universities such as MIT, University of Michigan, University of California at Berkeley, University of Illinois Urbana-Champaign, and Texas A&M University. Most of our M.S. and Ph.D. graduates are employed at the national laboratories, federal agencies (DOE, NRC) and in the private sector.

1E. Primary Constituents and Stakeholders

Discuss and provide evidence of outreach or community activities (local, regional, national, and/or international) offered by the unit including: how these activities relate to the unit's achievement of its student learning goals; and the impact of these activities on the academic and/or professional success of students. (These activities could include activities such as colloquia, case competitions, conferences, speaker series, performances, community service projects, research, etc.)

Satisfaction of student learning goals and outcomes can be directly correlated to student success. As an example, students present Senior Capstone Designs, as well as results from research projects undertaken as part of an Undergraduate Research Experience and Senior Honors Thesis, at the annual ANS Student Conferences and routinely win best paper and/or best presentation awards. The visibility resulting from their success frequently leads to offers from graduate schools and positions them for competitive merit based scholarships. Sustained undergraduate and graduate internship offers from Sandia National Labs and Los Alamos National Lab provide additional evidence of student success that follows from achievement of outcomes. A significant number of our B.S. degree graduates go on to pursue graduate studies at UNM as well as highly ranked universities such as MIT, University of Michigan, University of California at Berkeley, University of Illinois Urbana-Champaign, and Texas A&M University. Most of our M.S. and Ph.D. graduates are employed at the national laboratories, federal agencies (DOE, NRC) and in the private sector.

1F. Student Learning Goals and Outcomes Strategic Planning

Discuss how the unit's strategic planning efforts have evolved in relation to student learning goals and outcomes of its degree/certificate program(s), serving its constituents and stakeholders, and contributing to the wellbeing of the university and UNM community. Include an overview of the unit's strategic planning efforts going forward. For example, discuss the strengths and challenges of the unit, including the steps it has taken to maximize its strengths and address both internal and external challenges.

Formal strategic planning happened only occasionally in the department as it is mostly aligned with the School of Engineering initiatives. The department, however, constantly assesses the student outcomes to ensure student success. In recent years the department has been hampered by the small faculty size, which led to the need to seek adjunct faculty to cover teaching. This makes maintaining accessibility and quality challenging. We have thus tried to utilize, to the extent possible, our own emeritus faculty, research faculty, and Ph.D. candidates for the purpose.

Criterion 2. Teaching and Learning: Curriculum

The unit should demonstrate the relevance and impact of the curriculum associated with each degree/certificate program. (Differentiate for each undergraduate and graduate degree and certificate program offered by the unit.)

2A. Curricula

Provide a detailed description of the curricula for each degree/certificate program within the unit. (1) Include a description of the general education component required and program-specific components for both the undergraduate and graduate programs. (2) If applicable, provide a justification as to why any bachelor's degree program within the unit requires over 120 credit hours for completion.

2A.1. Undergraduate Program

Students completing the B.S. degree program are prepared for both professional careers and further study. The curriculum contains mathematics, science, and a rigorous set of engineering courses that prepare students for both avenues of personal development. This is evident in the choices our students make. Essentially all of our students leave with jobs as engineers or enter a graduate school in engineering or business.

UNM Core Curriculum

All undergraduates at UNM are required to complete the UNM core curriculum. The UNM core courses are classified into seven areas: Writing and Speaking, Mathematics, Physical and Natural Sciences, Social and Behavioral Sciences, Humanities, Foreign Language, and Fine Arts. Students have numerous options for satisfying the UNM core. These can be found at: https://unmcore.unm.edu/index.html .

Undergraduate Design Experience

We seek to graduate students who are capable of making decisions, analyzing alternatives, and creating integrated designs that are solutions to engineering problems with economic and political constraints. To help achieve this we have integrated design into our courses, from the sophomore through senior year. Our philosophy for design is to expose the student to a variety of design topics representative of the types of assignments they may expect in an industrial setting. We feel they should be given exposure to modern computational and design tools and that they should have experience working in groups as well as individually.

The curriculum now requires a minimum of 124 credits for graduation. One semester credit is normally defined to entail one hour of lecture per week or three hours of laboratory. Each semester normally involves 15 weeks of classes, exclusive of final exams and breaks. A detailed listing of the curriculum courses and their relation to the Professional Component categories is provided in Table 2-1. Table 2-1 shows the class work required in the B.S. degree program. The courses are classified as mathematics / science, engineering, or general education according to the ABET requirements.

Table 2-1 Curriculum
(Nuclear Engineering)

Course (Department, Number, Title) List all courses in the program by term starting with the first term of the first year and ending with the last term of the final year.	Indicate Whether Course is Required, Elective or a Selected Elective by an R, an E or an SE.[1]	*Subject Area (Credit Hours)*			
		Math & Basic Sciences	Engineering Topics Check if Contains Significant Design (√)	General Education	Other
NE 101 – Introduction to Nuclear Engineering	R		*1*		
Math 162 – Calculus I	R	4			
Chem 121- General Chem I Chem 123L –Gen Chem I Lab	R	3 1			
Engl 111 – Composition I	R				*3*
Core Humanities Elective	SE			*3*	
Math 163 – Calculus II	R	4			
Chem 122- General Chem I Chem 124L –Gen Chem I Lab	R	3 1			
Engl 112 – Composition II	R				*3*
Physics 160 – General Physics	R	3			
CS 151 – Computer Programming Fund for Non-Majors	R	1			*2*

Table 2-1 (Continued) Curriculum
(Nuclear Engineering)

Course (Department, Number, Title) List all courses in the program by term starting with the first term of the first year and ending with the last term of the final year.	Indicate Whether Course is Required, Elective or a Selected Elective by an R, an E or an SE.[1]	*Subject Area (Credit Hours)*			
		Math & Basic Sciences	Engineering Topics Check if Contains Significant Design (√)	General Education	Other
NE 230 – Principles of Radiation Protection	R		3		
Math 264 – Calculus III	R	4			
Econ 105 – Intro to Macroeconomics	R			3	
Engl 219 – Technical and Professional Writing	R				3
Physics 161 – General Physics	R	3			
NE 213 – Lab Electronics for Nucl, Chem, and Bio Engineers	R		3		
NE 231 – Principles of Nuclear Engineering	R		3		
NE 314 – Thermodynamics and Nuclear Systems	R	1.5	1.5 ✓		
NE 371 – Nuclear Materials Engineering	R		2		
Math 316 – Applied Ordinary Differential Equations	R	3			

Table 2-1 (Continued) Curriculum
(Nuclear Engineering)

Course (Department, Number, Title) List all courses in the program by term starting with the first term of the first year and ending with the last term of the final year.	Indicate Whether Course is Required, Elective or a Selected Elective by an R, an E or an SE.[1]	*Subject Area (Credit Hours)*			
		Math & Basic Sciences	Engineering Topics Check if Contains Significant Design (√)	General Education	Other
NE 311 – Introduction to Transport Phenomena	R		3		
NE 315 – Nuclear Engineering Analysis and Calculations	R		3		
NE 323L – Radiation Detection and Measurement	R		3 ✓		
CE 202 – Statics	R		3		
Core Social/ Behavioral Sciences Elective	SE			3	
NE 312 – Unit Operations	R		3 ✓		
NE 313L – Intro to Lab Techniques for Nuclear Engineers	R		3		
NE 330 – Nuclear Engineering Science	R	3			
Technical Elective	SE				3
Core Second Language Elective	SE			3	

Table 2-1 (Continued) Curriculum
(Nuclear Engineering)

Course (Department, Number, Title) List all courses in the program by term starting with the first term of the first year and ending with the last term of the final year.	Indicate Whether Course is Required, Elective or a Selected Elective by an R, an E or an SE.[1]	*Subject Area (Credit Hours)* Math & Basic Sciences	Engineering Topics Check if Contains Significant Design (√)	General Education	Other
NE 410 – Nuclear Reactor Theory I	R		3		
NE 462 – Monte Carlo Techniques for Nuclear Systems	R		3		
NE 464 – Thermal Hydraulics of Nuclear Systems	R		3 ✓		
NE 497L – Nuclear Engineering Computational Methods	R		3 ✓		
Core Humanities Elective	SE			3	
NE 413L – Nuclear Engineering Laboratory I	R		3		
NE 452 – Senior Seminar	R				1
NE 470 – Nuclear Fuel Cycle and Materials	R		3 ✓		
NE 498L – Nuclear Engineering Design	R		4 ✓		
Nuclear Engineering Technical Elective (select from NE 439, NE 468, NE 485, or NE 499)	SE		3		
Core Fine Arts Elective	SE			3	

Table 2-1 (Continued) Curriculum
(Nuclear Engineering)

Course (Department, Number, Title) List all courses in the program by term starting with the first term of the first year and ending with the last term of the final year.		Indicate Whether Course is Required, Elective or a Selected Elective by an R, an E or an SE.[1]	*Subject Area (Credit Hours)* Math & Basic Sciences	Engineering Topics Check if Contains Significant Design (√)	General Education	Other
Summary						
TOTALS-ABET BASIC-LEVEL REQUIREMENTS			34.5	*56.5*	*18*	*15*
OVERALL TOTAL CREDIT HOURS FOR COMPLETION OF THE PROGRAM		124				
PERCENT OF TOTAL			27.8%	45.6%	*14.5%*	*12.1%*
Total must satisfy either credit hours or percentage	Minimum Semester Credit Hours		32 Hours	48 Hours		
	Minimum Percentage		25%	37.5 %		

Curricular Changes

Prior to the Fall 2013 semester, the UNM-mandated minimum number of credit hours required to earn a Bachelor's degree was 128. During Fall 2013, the Provost proposed reducing this minimum to 120 credit hours. This proposal was approved by the faculty senate in Spring 2014. Subsequently, the Provost strongly encouraged all Bachelor's degree programs at UNM to reduce the required number of hours to as close to 120 hours as possible. The main rationale for this change was to improve the overall UNM graduation rates, which are factored into the state higher education funding formula. During a series of meetings, it was determined that Physics 262 (modern physics) was not providing significant additional information beyond what was being taught in NE 330. Thus it was decided to drop Physics 262 as a graduation requirement and to add 1 credit hour to NE 330 (changing from 2 to 3 credit hours) so background material on modern physics could be incorporated in that class. To allow the students to focus on nuclear engineering classes, one of the two technical electives was dropped. Most of the students were taking these technical electives in the math department, which provided good math background. However, it was determined that the typical math classes taken as technical electives were not complementing material in the NE undergraduate program. Further review of the NE curriculum indicated that although students were taking a numerical analysis class, ChNE 317, they didn't seem to be connecting those skills with the material in the neutron diffusion class (ChNE 310) and the computational methods class (NE 497L). After much discussion, it was decided to merge the numerical analysis class with the neutron diffusion class creating a new class, NE 315 - Nuclear Engineering Analysis and Calculations. This class covers: Application of analytical and numerical techniques to neutron diffusion problems and point reactor kinetics. Includes data analysis; solution of ODEs and PDEs for nuclear criticality problems, and point kinetics with and without delayed neutrons. All of the changes for credit hour reduction are summarized in Table 2-2. These changes are expected to create a more coherent curriculum and reduce the credit hours required for graduation from 133 to 124.

Table 2-2 – Summary of Changes to Reduce Required Credit Hours

<table>
<tr><td>Remove Physics 262 (3 credit hours) as requirement</td><td>Add pertinent material to NE 330 – Nuclear Engr. Science (add 1 credit hour)</td></tr>
<tr><td>Remove one of two technical electives (3 credit hours) as requirement</td><td></td></tr>
<tr><td>Remove ChNE 310 Diffusion Theory (3 credit hours) as requirement</td><td rowspan="2">Create a new course, NE 315 – NE Analysis and Calculations (3 credit hours) that merges material from 310 and 317</td></tr>
<tr><td>Remove ChNE 317 Numerical Calculations (3 credit hours) as requirement</td></tr>
<tr><td>Reduced credit hours of CBE/NE 311 Transport Phenomena by 1 credit hour (from 4 CR to 3 CR). This brought the class in line with others in terms of contact hours.</td><td></td></tr>
<tr><td>13 Credit Hours Removed</td><td>4 Credit Hours Added</td></tr>
</table>

These changes were approved by the UNM faculty senate in the Spring of 2015, and students have already begun to graduate under the new reduced credit hour curricula. It will be difficult to reduce the credit hours further without reducing the UNM core requirement.

2A.1 Graduate Program

Offerings: The Department of Nuclear Engineering offers MS and PhD degrees in Nuclear Engineering, with several MS concentrations possible. The MS are discussed here. The PhD is discussed in a following section. The options are:

MS in Nuclear Engineering, Plan I (thesis), Plan II (non-thesis), and Plan III (course work only) options

PhD in Engineering, concentration in Nuclear Engineering

MS in Nuclear Engineering, concentration in Radiation Protection Engineering (Plan II)

MS in Nuclear Engineering, concentration in Medical Physics (Plan II)

The M.S. is offered under Plan I, Plan II, and Plan III options. Under Plan I (thesis), 30 credit hours are required with 24 credit hours of course work and 6 credit hours of thesis. Of the 24 credit hours of course work, 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 course work 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, called a practicum for the professional degrees, under the direction of a faculty member is also required. A Plan III option (course work only) was introduced in Fall 2017, which requires 30 credit hours of course work including a maximum of 6 credit hours of problems courses. For the MS degree, up to half of the coursework units may be transferred by students admitted with degrees from other universities upon approval of the graduate academic advisor on a case-by-case basis.

All candidates for the M.S. degree must satisfactorily pass a final examination which emphasizes the fundamental principles and applications in nuclear engineering. This examination is normally the thesis defense for Plan I students, and is normally based on a short term project 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.

500 level classes count for graduate credit. 400 level marked with * may be taken for graduate credit with instructors approval.

Core courses: Students pursing an MS or PhD in Nuclear Engineering are required to take the core courses listed below. Courses listed below are for traditional MS and PhDs in

Nuclear Engineering. Note: Core courses differ for students pursuing a Master's with a concentration in Radiation Protection Engineering or Medical Physics.

- NE 501/502 Graduate Seminar 1 hour each
  (required every semester up to 3 semesters for MS students, up to 6 semesters for PhD students)
- NE 525 Methods of Analysis in Chemical and Nuclear Engineering 3 hours
- NE *410 Nuclear Reactor Theory 3 hours
  (required for those students who do not have a background in nuclear reactor theory)

Concentration requirements: The requirements for the MS in Radiation Protection Engineering and for the Medical Physics differ from the MS in traditional Nuclear Engineering.

For the RPE option: Prerequisites for application are a bachelor's degree in engineering from an ABET-accredited program. In lieu of that a bachelor's degree including: a minimum of one year of general college chemistry with laboratory, one year of general college physics with laboratory, one year of differential and integral calculus, a semester of differential equations, 1 semester hour of computer programming, and 32 semester hours of mathematics (calculus level or above) and science.

Students concentrating in the RPE program are required to take five core courses in health physics:

- NE 523L Environmental Measurements Laboratory 3 hours
- NE 524 Interaction of Radiation with Matter 3 hours
- NE/MPHY 527 Radiation Biology for Engineers and Scientists 3 hours
- NE 528 External Radiation Dosimetry 3 hours
- NE 529 Internal Radiation Dosimetry 3 hours

Another 12 credit hours of electives are required to complete the RPE course work. In addition to the 30 credit hours of courses, students must take 6 credit hours of NE 591 Practicum. The practicum involves a semester long project in the area of health physics usually under the supervision of a certified health physicist. After completing the course work and practicum, the student is awarded a master's degree in Nuclear Engineering with a radiation protection engineering (health physics) concentration. Graduates of the RPE concentration do not qualify for automatic admission to the Ph.D. program. They must fulfill all prerequisite requirements for the Ph.D. program before they may be admitted. The Radiation Protection Engineering concentration is a Plan II program and does not have a thesis option.

For the Medical Physics option: The University of New Mexico Department of Nuclear Engineering and the School of Medicine Department of Radiology share resources to administer the MS in Nuclear Engineering with a concentration in Medical Physics. The program is administered through the Department of Nuclear Engineering. The University of New Mexico Master of Science Program in Medical Physics received its accreditation from the Commission on Accreditation of Medical Physics Education Program (CAMPEP) in December of 2009.

Requirements for application to the MS in Nuclear Engineering with a concentration in Medical Physics are: A technical bachelor's degree, one year of general college physics with laboratory (purely descriptive courses are insufficient; calculus based courses are desired). This must be equivalent to a minor in physics. Also required are one year of general college chemistry with laboratory; one year of differential and integral calculus; a survey course in general biology, human biology or mammalian physiology; and a total of 32 credit hours of science and math.

Master of Science in Nuclear Engineering in the Medical Physics concentration requires 35 graduate credit hours. No electives are included in this curriculum. The Medical Physics concentration is a Plan II program and does not have a thesis option. The required courses are listed below:

First Year Fall

- RADS *480 Human Cross Sectional Anatomy 3 hours
- MPHY 516 Medical Imaging I X-ray Physics 3 hours
- MPHY 517L Medical Imaging Laboratory I X-ray Physics 1 hour
- NE 524 Interaction of Radiation with Matter 3 hours

First Year Spring

- MPHY 540 Radiation Oncology Physics 3 hours
- MPHY 541L Radiation Oncology Physics Laboratory 3 hours
- NE 528 External Radiation Dosimetry 3 hours

Second Year Fall

- MPHY 518 Medical Imaging II MR Ultrasound and Nucl. Medicine Physics 3 hours
- MPHY 519L Medical Imaging Laboratory II MR Ultrasound and Nuclear Imaging Physics 1 hour
- NE 523L Environmental Measurements Laboratory 3 hours

Second Year Spring

- MPHY/NE 527 Radiation Biology for Engineers and Scientists 3 hours
- NE 591 Practicum 6 hours

Shared-Credit Program: B.S. to M.S. in Nuclear Engineering

The School of Engineering offers a Shared-Credit Degrees Program designed to allow students to complete B.S. and M.S. degrees in five years (depending on the student's mathematics preparation upon entering UNM as a first-year undergraduate student). To accomplish this, some courses are counted towards both the Bachelor's and Master's degrees.

The Department of Nuclear Engineering allows up to 9 credit hours of undergraduate coursework to be replaced by 500 level graduate courses that count towards both degrees.

Eligibility: Students may apply to the Shared-Credit Program during the undergraduate junior year. A cumulative GPA of at least 3.50 is normally required, counting only the completed courses applicable to B.S. in N.E. at the time of application. Students with a cumulative GPA below 3.5 but above 3.0 have the opportunity to apply, with a recommendation from faculty required, and acceptance is on a case-by-case basis with approval of the MS program faculty director - either the chair or the graduate academic advisor.

3 + 2 B.S./M.B.A. Program

In cooperation with the Anderson School of Management at the University of New Mexico, the School of Engineering offers a “3 + 2” program of studies leading to the B.S. and M.B.A. degrees in five years. This program involves selecting core and technical electives that are compatible with both degree programs and applying to the M.B.A. program at the end of the junior year of engineering studies.

PhD in Engineering Degree (Concentration in Nuclear Engineering)

The Doctor of Philosophy degree requires 48 credit hours beyond the bachelor's degree, exclusive of the dissertation credit. 18 hours of dissertation credit are also required. At least 24 hours of coursework applied to the degree must be completed at UNM. At least 18 hours must be completed after formal admission to the doctoral program (or approval of Change of Degree Form for students continuing from the MS). 24 hours maximum course credit may be applied to a master’s degree, which may include up to an additional 6 hours of MS thesis credit. The degree also requires passing a comprehensive exam, and writing and defending a research dissertation.

Course Requirements:

In addition to the general University doctoral degree requirements listed in the Graduate Programs section of the UNM Catalog, students pursuing a PhD in Engineering with a concentration in Nuclear Engineering must meet the core course requirement as described above. Three semesters of seminar course must be taken beyond the three semesters of MS degree seminar course requirements.

Comprehensive Examination:

The Comprehensive Examination must be administered and passed in the same semester the Application for Candidacy form is approved by the Graduate Program Director and the Dean of Graduate Studies.

Defense of Dissertation:

All candidates must pass a Final Examination (Defense of Dissertation). The Dissertation Committee conducts the defense of the dissertation.

Detailed program requirements can be found at the websites http://ne.unm.edu/students/graduate/ and http://catalog.unm.edu/catalogs/2017-2018/colleges/engineering/nuclear/graduate-program.html

2B. Contributions to other Units

Discuss the significance of the unit's contributions to and/or collaboration with other internal units within UNM, such as offering general education core courses for undergraduate students, common courses for selected graduate programs, courses that fulfill pre-requisites of other programs, courses that are electives in other programs, cross-listed courses, etc.

The department does not offer general education core courses for undergraduate students but the interdisciplinary courses listed below are cross-listed with other departments spanning the School of Engineering and School of Medicine.

NE 312 – Unit Operations is cross-listed as CBE 312 – It is jointly taught by NE and CBE faculty.

NE 439/539 – Radioactive Waste Management is cross-listed as CE 539. About 20% of the lectures are done by faculty from Civil Engineering.

NE 525 – Methods of Analysis in Nuclear, Chemical and Biological Engineering is cross-listed as CBE 525.

NE 527 – Radiation Biology for Engineers and Scientists is cross-listed as MPHY 527. It is taught in conjunction with the Medical Physics Program.

2C. Course Delivery Modes

Discuss the efficiency and necessity of the unit's mode(s) of delivery for teaching courses.

The Undergraduate Nuclear Engineering program is offered as a daytime program on the Albuquerque campus. About one-half of the required courses are offered on live TV (ITV) and with video on demand (VOD). Video on demand allows students to select and watch distance education courses live or as on demand over internet. Interactive Television (ITV) provides remote access for distance education students in Nuclear Engineering. Main campus courses are broadcast using videoconferencing, satellite and microwave technologies. Currently there are receive sites at the Gallup, Los Alamos, Taos and Valencia Branches as well as sites in Farmington, Santa Fe, Kirtland Air Force Base, Sandia National Labs, and UNM West. Those courses not selected for ITV/VOD are typically laboratory courses, computer-based courses, or design courses that require student presence on main campus.

Each required course is offered once a year in either the Fall or Spring Semester. Electives are offered either once a year or once every other year depending on student interest. Most courses are Web-enhanced with substantial course material available on-line. Some of the courses also use the assignment and test features of our Blackboard Learning Management System to allow remote submittal of student work along with quizzes and tests over the material.

A number of the courses are taught online. Most of the online courses still require students to come to campus two or three times a semester to do lab experiments. The online setting provides a convenient means and fewer interruptions for those working students, especially graduate students, to progress towards their degree.

2D. Teaching and Learning: Curriculum Strategic Planning

Discuss the unit's strategic planning efforts going forward for identifying, changing and/or examining areas for improvement in its curricula.

To avoid confusion and unnecessary administrative burden, the department does not intend to modify its curricula often. Adjustments were made to get down to 124 CR and in response to the assessment findings. Any future change of the curricula will be based on the assessment of student outcomes, which we conduct regularly as detailed in other chapters of this report.

Criterion 3. Teaching and Learning: Continuous Improvement

The unit should demonstrate the relevance and impact of the curriculum associated with each degree/certificate program. (Differentiate for each undergraduate and graduate degree and certificate program offered by the unit.)

3A. Overview of Assessment Process

Describe the assessment process and evaluation of the student learning outcomes for each degree/certificate program by addressing the items below. • Describe the overall skills, knowledge, and values are expected of all students at the completion of the program (refer to the program learning goals outlined in Criterion 1)? • Explain how the current direct and indirect assessment methods are established and administered as program-level assessments including how they are used to measure each student learning outcomes. Also, provide a description of the courses in which the assessment methods are administered and the extent to which students are expected to meet each student learning outcomes. • Explain and provide evidence of how the program has progressively improved, evolved and/or maintained the quality and effectiveness of its assessment structure and activities in order to reflect, sustain and/or maximize student learning (i.e., updated assessment plans, annual assessment reports, assessment maturity scores, etc.)

Undergraduate Program

The ABET assessment plan for the Nuclear Engineering Department at the University of New Mexico is designed to assess the eleven ABET outcomes *a* through *k*, which are the same as the student learning outcomes in Criterion 1. The goals of this assessment are to determine if undergraduate students, at the completion of the degree program, are satisfactorily knowledgeable in each of the outcome areas and to establish a framework for the continuous improvement of the program.

The student learning outcomes are closely related to the program educational objectives.

Achievement of the student outcomes is necessary for graduates to be able to achieve the program educational objectives. Table 3-1 maps the student outcomes onto the nuclear engineering program objectives.

Table 3-1. Relationship of Student Outcomes to Program Educational Objectives

	PROGRAM EDUCATIONAL OBJECTIVES		
STUDENT OUTCOMES By the time our graduates complete the nuclear engineering program, they will have successfully demonstrated the following:	Graduates will meet or exceed the expectations of employers of nuclear engineers.	Qualified graduates will pursue advanced study if they so desire.	Graduates will assume/undertake leadership roles in their communities and/or professions.
(A) an ability to apply knowledge of mathematics, science, and engineering	X	X	
(B) an ability to design and conduct experiments, as well as to analyze and interpret data.	X	X	
(C) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.	X	X	
(D) an ability to function on multidisciplinary teams.	X		X
(E) an ability to identify, formulate, and solve engineering problems.	X	X	
(F) an understanding of professional and ethical responsibility.	X	X	X
(G) an ability to communicate effectively	X	X	X
(H) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context.	X	X	X
(I) a recognition of the need for, and an ability to engage in lifelong learning.	X	X	X
(J) a knowledge of contemporary issues.	X		X
(K) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	X	X	

Attainment of the engineering criteria student outcomes will ensure that Nuclear Engineering graduates are prepared to attain the program educational objectives.

Undergraduate Program Assessment Methodology

Direct Measurement

Nuclear Engineering courses are the only courses used for undergraduate outcomes assessment. Mathematics, science, humanities, social sciences and other courses are part of the undergraduate degree program but are not used for outcomes assessment. The nuclear engineering student outcomes, associated performance criteria, intended assessment methods, and assessment status are provided on the following pages. For those joint classes involving both chemical and nuclear engineers, an attempt was made to record information only for the nuclear engineering students in the class.

Each outcome is assessed by directly examining student performance on exams, homework, essays, reports, projects, or oral presentations. The assessment is aided by the use of a rubric specifically designed to measure the outcome. In general, grades are not used for the assessment because the course grade may be based upon criteria other than that specified by the outcome.

Instructors teaching the courses select the student work to be assessed. This work is a normal part of the course and may consist of part or all of an exam, homework assignment, essay, report, or oral presentation. The student work is carefully selected so that it:

- is directly applicable to the outcome being measured.
- demonstrates knowledge that every student in the class should have.
- constitutes work the students would do even if the outcome was not being evaluated.

Rubrics, defined by the instructors, are used to evaluate the student work. These rubrics consist of performance criteria and levels of performance. The performance criteria divide the work into several, well defined components that relate to the outcome being assessed. The student is expected to show some level of performance in all of these components in the process of solving the problem, writing the report, etc. The level of performance defines how well the student performs in each criterion being measured. The Nuclear Engineering Department chose three levels to measure student performance. They are:

1. Does Not Meet Expectations – shows some capability but the quality of the work below what is expected for the course.
2. Meets Expectations – the work meets the expectations for the class.
3. Exceeds Expectations – the work is exceptional and exceeds the expectations for the class.

Student work is evaluated to see how well the students performed in each of the performance criteria categories. The work is evaluated by the instructor teaching the course, using the scale shown above. The students' scores on each of the performance criteria are averaged to determine how the class did as a whole. The expectation is that 75% of students in the program will achieve Adequate (3) or higher. Assessment data are recorded in files maintained centrally, and the course data that are used are maintained in notebooks. The results are transmitted to the Undergraduate Committee for their review. In addition, the assessment results for each semester are discussed in a faculty meeting in the following semester.

Indirect Measurement

Each semester graduating seniors are surveyed as part of the program outcomes assessment. The senior survey is not as detailed as the direct measure of student performance and will not give detailed information about student strengths and weaknesses. It does however; give a broader view of how the curriculum is perceived by the seniors.

Assessment Frequency

The NE Student outcomes were assessed over the last six years according to the schedule shown in Table 3-2. Each of the degree classes for the program is listed along with the identification of the skill that was assessed in that class. Some of the classes were not directly involved in the assessment, usually because they were taught early in the program. A later course was used to more effectively assess the skill. The entries in the table indicate the skill by letter and then the associated performance criterion by number, (e.g., A:PC2 is the second performance criterion for skill A).

Table 3-2. Student Outcomes Assessment Schedule

	Fall 2010 - ABET Review	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013	Fall 2013	Spring 2014	Fall 2014	Spring 2015	Fall 2015	Srping 2016 - prepare for ABET Self Study	Fall 2016 - ABET Review	Spring 2017	Fall 2017
NE 101 : Intro to NE															
NE 213: Electronics															
NE 230: Rad Protection			A:PC2						A:PC2						A:PC2
NE 231: Intro to NE															
CBE/NE 311: Transport Phen			A:PC1				A:PC1				A:PC1				A:PC1
CBE/NE 312: Unit Ops				E:PC1-5		C:PC1		E:PC1-5		C:PC1		E:PC1-5			
NE 313L: Intro NE Lab						G:PC1				G:PC1					
NE 314: Thermo and Nucl Syst															
NE 315: NE Anal and Calculations								New Course - Fall 2015			K:PC2		K:PC2		A:PC1 K:PC2
ChNE 317: Numerical Analysis					K:PC2				K:PC2	course removed, integrated into NE 315					
NE 323L: Rad Meas Lab					B:PC1,2				B:PC1,2				B:PC1,2		B:PC1,2
NE 330: Nucl Engr Science															
NE 371: Materials for NE															
NE 410: Reactor Theory															
NE 413L: Reactor Ops Lab				B:PC3-5		K:PC1		B:PC3-5		B:PC3-5 K:PC1		B:PC3-5			
NE 452: Senior Seminar						F:PC1-3; G:PC2: H:PC2-3;				F:PC1-3; G:PC2: H:PC2-3;					
NE 462: Monte Carlo															K:PC3
NE 464: ThermalHydraulics					A:PC3				A:PC3				A:PC3		
NE 470: Fuel Cycle and Rx Matls															
NE 497L: Computation Methods			K:PC1,3		I:PC2		K:PC3		I:PC2		K:PC3				I:PC2 K:PC3
NE 498L: Senior Design		D:PC1-3		C:PC2,3 H:PC1				D:PC1-3		C:PC2,3 D:PC1-3 H:PC1					

In parallel to the program outcome assessment described above, all mandatory courses in the undergraduate program have an independent assessment of course-specific outcomes each time the course is taught. In addition, the Undergraduate Program Committee reviews program outcome assessment data from the overall perspective of the curriculum. This analysis involves factors that go beyond the performance criteria measurements. For example, past reviews indicated there was a need for more active learning time in the CBE/NE 312 Unit Operations class, so the class periods have a summary lecture followed by in class problem solving sessions where individuals or teams of students work on the applications of the material. This is an example of a continuous improvement process that relies on the quantitative outcome assessment as well as other feedback mechanisms.

Assessment Feedback Loop

Once the assessment data is gathered every semester, the results are shared in a faculty meeting. Weaknesses in the outcomes data point to high priority areas for improving our curriculum. The curriculum can be improved by adding one or more lectures, adding or modifying study materials, modifying or adding homework assignments, or in some cases creating an entirely new course.

The changes to the curriculum may not be made in the course where the problem was detected. The changes may be made in lower level courses so that students are better prepared for the work when they reach the course where the assessment was made. Once the correction to the curriculum is implemented, the outcome or outcomes will be reassessed to see if the change produces the intended effect. The reassessment may be done more frequently than the planned schedule if it is possible to immediately measure the effects of the change. The curriculum modification and outcomes associated with this modification will be closely monitored. The outcomes will be reassessed and the curriculum modified until the desired effect is clearly demonstrated.

Improving the Assessment Process

In Spring 2018, the assessment process was reviewed with two major changes to be implemented starting Fall 2018.

- In the past selected courses were involved in the Undergraduate Assessment as the philosophy was to measure impact at the junior or senior level. However, it was noted that not all faculty had courses that were being assessed and as such did not have an understanding of the assessment process. Starting Fall 2018, all required NE undergraduate classes will be involved in the assessment process and have at least one sub-skill assessed through student work in that class. The assessment will still be loaded towards the upper division classes to determine the efficacy of the NE program.

- As ABET has transitioned from skills a through k to skills 1 through 7, effective Fall 2018, the assessment grid will be redone to include the new skills and showing all required NE undergraduate classes. For the most part, skills a through k map directly into skills 1 through 7 with the exception of skill k that is not directly involved in any of the skills 1 through 7.

Graduate Programs

Graduate program improvement is based on several types of outcome assessment, including surveys and direct assessment of students' work. Survey instruments include those offered by UNM (IDEA before 2015, EvaluationKIT since 2015) and those developed by individual instructors on their own initiative. The UNM surveys mostly focus on efficiency of instructors, not teaching outcomes. Historically, we used a combination of surveys of recent graduates and alumni, which was supplemented with rubric-based assessment of graduate student work. Two separate outcome assessment plans have been developed for the MS and PhD programs, with annual reports presenting summaries of the rubric-based assessments. The focus of the rubric-based assessment is on the final work product of the student (thesis/dissertation defense, report, etc.).

Outcomes for PhD Degree Program - Students receiving the PhD degree will:

1) Exhibit knowledge of engineering and science fundamentals appropriate for the Nuclear Engineering discipline and/or specialization.
2) Demonstrate a depth of knowledge in the specialization.
3) Have the ability to conduct original research.
4) Have demonstrated the ability to perform a critical review of the literature in the area of specialization.
5) Be able to communicate effectively.

Outcomes for MSNE Program - Students receiving the MSNE degree will:

1) Exhibit knowledge of engineering and science fundamentals appropriate for the Nuclear Engineering discipline and/or specialization.
2) Be able to communicate effectively.
3) Demonstrate the ability to critically assess information in the Nuclear Engineering discipline and/or specialization.

Assessment Plans - For students receiving a PhD or an MS degree, the student's exam committee determines whether the student has achieved the outcomes based on the student's dissertation, thesis, or report of the independent study/project work. This is documented on a rubric that is developed for this purpose (please see below). This rubric is filled out by a consensus of the committee rather than by each individual member of the committee.

Results of the outcomes assessment for each student are evaluated by the department's graduate committee. The evaluations prepared by the graduate committee are reported to the SOE graduate committee for analysis, discussion, feedback, and any necessary action.

UNM SCHOOL of ENGINEERING

Nuclear Engineering PhD Outcomes Assessment Rubric

To be completed by committee chair in consultation with exam committee.

Student: ___________________ Degree program/concentration:_____________

Date:______________________

Outcome	Unacceptable (1)	Marginal (2)	Acceptable (3)	Exceptional (4)	Rating
1) Knowledge of Nuclear Engineering fundamentals appropriate for discipline and specialization	No evidence of PhD-level fundamental knowledge in Nuclear Engineering.	Rudimentary knowledge of Nuclear Engineering exhibited in written document and oral presentation.	Knowledge of Nuclear Engineering fundamentals evident in written and oral presentation.	Demonstrates mastery of appropriate fundamentals of Nuclear Engineering.	
2) Depth of knowledge in specialization	Only rudimentary knowledge in specialization.	Some knowledge of specialization demonstrated.	Demonstrates appropriate level of knowledge in specialization.	Demonstrates knowledge of specialization comparable to experienced practitioner.	
3) Ability to conduct original and independent research	No evidence of planning and execution of research program.	Some useful research results with some evidence of original work.	Carried out good research program, achieved useful and novel results.	Excellent planning and execution of research program. Excellent results.	
4) Ability to perform critical review of literature in Nuclear Engineering and area of specialization	Rudimentary literature review.	Some review of the literature, but little critical evaluation.	Comprehensive review of literature with evidence of critical thinking about further needs for research in this area.	Extensive review of literature with critical evaluation comparable to a review article in literature.	
5) Able to communicate effectively	Dissertation poorly written. Oral exam not well planned or presented. Unable to answer questions.	Dissertation mostly clearly written. Presented main points clearly. Able to answer some but not all of the questions posed by committee.	Well written and well organized dissertation. Well organized and clear presentation. Good ability to answer questions.	Excellent job of writing and organizing dissertation. Well organized talk. Able to respond to questions and facilitate further discussion of results.	
Overall Assessment	Unacceptable (1)	Marginal (2)	Acceptable (3)	Exceptional (4)	

Comments (use back if necessary):

What curricular or process changes can you suggest to improve student performance in these areas (use back if necessary)?

Form to be sent to department/program grad committee and SoE Associate Dean for Academics.

UNM SCHOOL of ENGINEERING

Nuclear Engineering Masters Degree Outcomes Assessment Rubric

To be completed by committee chair in consultation with exam committee.

Student: ____________________ Degree program/concentration:________________

Date:_______________________

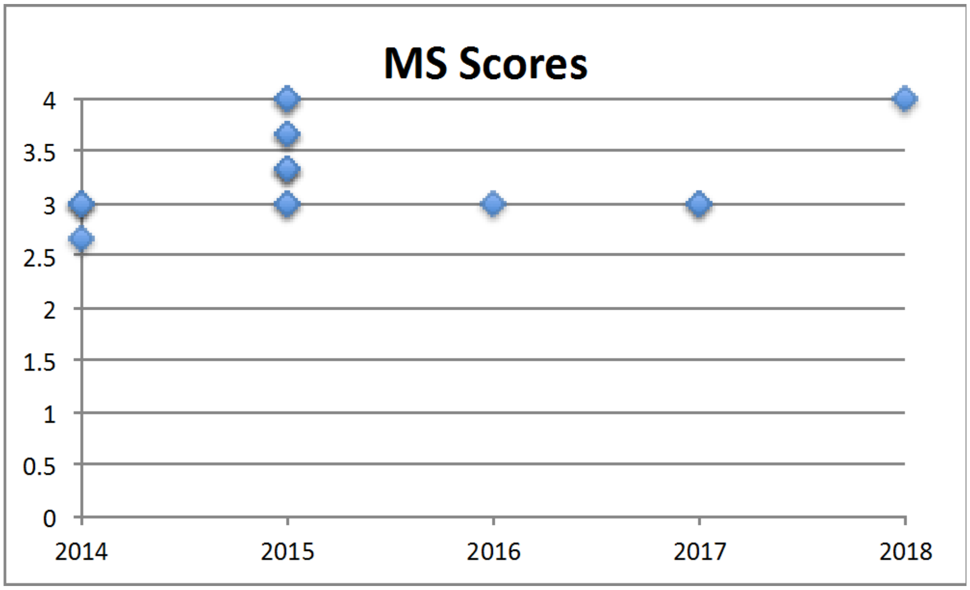
Outcome	Unacceptable (1)	Marginal (2)	Acceptable (3)	Exceptional (4)	Rating
1) Knowledge of Nuclear Engineering fundamentals appropriate for discipline and specialization	No evidence of Masters level fundamental knowledge of Nuclear Engineering.	Rudimentary knowledge of Nuclear Engineering exhibited in written document and/or oral presentation.	Knowledge of fundamentals of Nuclear Engineering evident in written and/or oral presentation.	Demonstrates mastery of appropriate fundamentals of Nuclear Engineering for the discipline.	
2) Ability to communicate effectively in oral and/or written form	Document poorly written; and/or poorly organized oral presentation.	Document mostly clearly written. Presented main points clearly; and/or oral presentation mostly clear and well-organized.	Well written and well organized document; and/or good job of organizing talk and well presented oral report.	Excellent job of writing and organizing document and discussion of results; and/or excellent job of organizing and presenting oral report.	
3) Ability to critically assess or apply information in Nuclear Engineering and specialization	Rudimentary review or application of disciplinary information.	Some review or application of disciplinary information, but little critical evaluation.	Comprehensive review or application of disciplinary information with evidence of critical thinking about further needs for research or study in this area.	Extensive review or application of disciplinary information with critical evaluation comparable to a review article in literature; or knowledge comparable to that of an experienced practitioner in Nuclear Engineering.	
Overall Assessment	Unacceptable (1)	Marginal (2)	Acceptable (3)	Exceptional (4)	

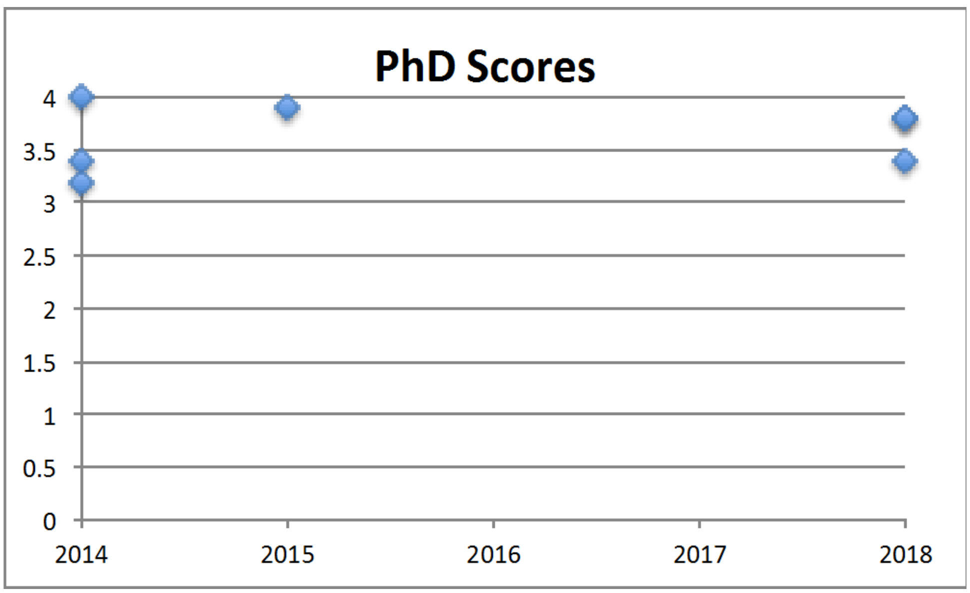
Comments (use back if necessary):

What curricular or process changes can you suggest to improve student performance in these areas (use back if necessary)?

Form to be sent to department grad committee and SoE Associate Dean for Academics.

Outcomes since 2014 have been collected and are presented below, the average score for a student is given.





The average scores for all presented MS rubrics is 3.3 and for all presented PhD rubrics is 3.6.

3B. Impact of Assessment Process on Unit

Synthesize the impact of the annual assessment activities for each degree/certificate program by addressing the items below. • How have the results of each of the aforementioned program-level assessment methods been used to support and inform quality teaching and learning? • How have the results/data from the program's assessment methods and/or activities been used for program improvement and/or to maximize student learning? • Overall, how does the program utilizes it *assessment structure to engage in a coherent process of continuous curricular and program improvement? Include an explanation of how the program strategically monitor the short- and/or long- term effects and/or impact of it changes.*

Undergraduate Program

Program improvement is based on the outcomes assessment. The outcomes are assessed using a senior survey, learning outcomes surveys from each class, and the direct assessment of student work. To date, the direct assessment of student work is the most informative and useful in making improvements to the program.

As described in Sec. 3A, assessment data are recorded in files maintained centrally, and the course data that are used are maintained in notebooks. The results are transmitted to the Undergraduate Committee for their review. In addition, the assessment results for each semester are discussed in a faculty meeting in the following semester.

Weaknesses in the outcomes data point to high priority areas for improving our curriculum. The curriculum can be improved by adding one or more lectures, adding or modifying study materials, modifying or adding homework assignments, or in some cases creating an entirely new course.

The changes to the curriculum may not be made in the course where the problem was detected. The changes may be made in lower level courses so that students are better prepared for the work when they reach the course where the assessment was made. Once the correction to the curriculum is implemented, the outcome or outcomes will be reassessed to see if the change produces the intended effect. The reassessment may be done more frequently than the planned schedule if it is possible to immediately measure the effects of the change. The curriculum modification and outcomes associated with this modification will be closely monitored. The outcomes will be reassessed and the curriculum modified until the desired effect is clearly demonstrated.

Course Revision Based on Learning Outcomes Assessments

In parallel to the program outcome assessment described above, all mandatory courses in the undergraduate program have an independent assessment of course-specific outcomes each time the course is taught. In addition, the Undergraduate Program Committee reviews program outcome assessment data from the overall perspective of the curriculum. This analysis involves factors that go beyond the performance criteria measurements. Past reviews indicated there was a need for changes in ChNE 317 related to integration of programming skills into technical material. This review was one of the main factors for combining ChNE 310 and ChNE 317 into the new NE 315 course to use numerical techniques and programming for the solution of neutron diffusion and kinetics problems. Past reviews also indicated there was a need for more active learning time in the NE 312 Unit Operations class, so the class periods have a summary lecture followed by in class problem solving sessions where individuals or teams of students work on the applications of the material. These are two examples of the continuous improvement process that relies on the quantitative outcome assessment as well as other feedback mechanisms.

The course assessment portion of our process has been completed several times, as have the discussions with our graduating seniors. Numerous examples of small changes in course delivery, methods, and content have been made as a product of the course assessment cycle. We omit most of such changes here to focus on substantive course changes and program-level changes. As noted above, the major change has been the addition and deletion of courses from the curriculum. Table 3-3 summarizes some changes, beyond the curriculum revision, that have been recently implemented based on assessment tools, in particular from student input.

TABLE 3-3

Course	Changes
NE 230 Principles of Radiation Protection	Put the material into online format with many, short (5 to 12 minute) videos on each topic. This will allow the students to review the material at their pace whether it is an online class or a face-to-face class with online supplement.
	While the online videos seemed to provide a useful flow and review of the material, it appears that the commitment and organizational skills required by an online course don't fit the abilities of the sophomore students. This is particularly a problem in this course as it is the first nuclear engineering course taken by the undergraduates. The students had problems forming studying groups and doing team assignments. The video library will be retained and used in a flipped classroom setting for this course.
	It is suggested that the class be taught face-to-face using the flipped classroom model. Have the students use the video library to study the assigned topics and then spend the class time doing problems individually and in groups. Have them present the problems. This will provide opportunities for group interactions and allow the students to form study groups.
NE 231 Introduction to Nuclear Engineering	While the course seemed to go well without changes from previous years, as the result of overall curricula review at the faculty meeting on May 5, 2016, we decided to undertake a full review of the material in NE 231 and NE 314 in particular with regard to how they interconnect and feed subsequent courses.
NE 312 – Unit Operations	Need to provide an example pump curve and a demonstration of how to fill out the associated spec sheet.
	Need to work with the Learn staff to get the teamwork form up on learn. Then to make sure it will be easy for the students to complete and then automatically calculate the associated teamwork scores.
	For each of the quizzes associated with a topic: Allow them to have two tries at the quiz with some hints on wrong answers. Then provide worked solutions after the quiz closes. This can be done with adaptive release in Learn.
	For the quizzes associated with design projects: try to have at least 8 questions so no question is worth more than 5 points. Have the quiz progress through the analysis in the same order as will be done in the design project. Provide the sequential order in the quiz description.
	Revise the thermosiphon reboiler example using Chen or Jenns-Lottes calculations for the inside film coefficient. Then compare with the coefficient using Kern in a boiling example.

NE 314 Nuclear Systems	Need to coordinate better with NE 231 to better prepare the students on reactor technology (both LWR and non-LWR). Both classes are better served if the students (almost always taking in parallel) have a fundamental basic understanding of how a reactor generates electricity .
	Would be nice to have the students try and visit a Nuclear Power Plant as part of ANS. They benefitted greatly from a morning tour of the Reeves plant but would be best served to also see Palo Verde.
NE 323L – Radiation Detection and Measurements Laboratory	Students have long had a hard time learning the format expected of their lab reports. Some student feedback suggested that the sample lab report than had previously been provided was written at a lower level that was expected in the class. Therefore, for the Fall 2013 semester, the sample lab report was revised such that the level was actually a little higher than expected in hopes of actually getting the level desired. The report was a somewhat different version of the gamma-ray spectroscopy lab that the students conduct, for which they are only expected to do the analysis and make comments as appropriate. Thus, the sample lab report not only serves as an example lab report but provides a concise presentation of some of the results that they should be obtaining in the gamma-ray spectroscopy lab as well as a discussion of the supporting theory. The introduction of this sample lab report has seemed to improve some of the formatting issues that had been prevalent but still fell far short from solving the problem. Clearly something else needs to be done. The change that may have the greatest potential would be to see if the English Department would agree to a special section of English 219 Technical Writing that would explicitly address the writing of lab reports.
	For many years we attempted to teach the functionality of the various electronic units and instruments used in lab as they were introduced in the various labs. Many students did not seem to fully grasp the functionality of the new electronics (such as a Single Channel Analyzer) after only a quick introduction prior to conducting a lab. Thus, they did not really understand the data that they were taking. To help address this, we introduced an electronics lab at the beginning of the semester. Each student conducts this lab one-on-one with an instructor. Then the instrumentation is reviewed as the electronics are re-introduced in subsequent labs. This electronics lab has definitely helped most students understand the function of the various types of electronics used in the lab.

NE 413L – Nuclear Engineering Laboratory I	For all reports, have them submitted electronically accompanied by excel or MATLAB to provide calculation backup. Emphasize that the material must be suitable for peer review.
	Add data quizzes for AGN-1, AGN-2, AGN-3, and AGN-4. These should cover the information sought in the data reports. Follow up with memo reports emphasizing analysis of the data.
	For AGN-4, require the students to be more specific on the interpretation of the results from each step, and require a backup excel sheet to demonstrate the process of uncertainty analysis.
NE 452 – Senior Seminar	The course went fairly well. Moving to a regular classroom as opposed to our previous round table seemed to impede the discussions somewhat. Will have to see if that can be improved as the situation will probably be the same next year.
	This semester the students took notes on the ethical issues presented in “Morales”. This, on the other hand, seemed to promote a good discussion of the ethical issues so this will be continued.
NE 497L Introduction to Nuclear Engineering Design	Introduce two representative reactor designs at the beginning of the class to provide a continuous context/framework for highlighting computational methodology needs and application of computational techniques learned.
	Introduce a thermofluids/thermohydraulics module and associated representative code(s)

Graduate Programs

Presently assessment results offer no cause for concern, but robust monitoring is necessary to ensure both the short-term consistency and the long-term sustained improvement of the graduate program. For example, appearance of lower-than “acceptable” scores, 3, in rubric 1 (Knowledge of Nuclear Engineering/Science Fundamentals...) could indicate a need to review/upgrade the graduate curriculum.

Criterion 4. Students (Undergraduate and Graduate)

The unit should have appropriate structures in place to recruit, retain, and graduate students. (If applicable, differentiate for each undergraduate and graduate degree and certificate program offered by the unit.)

4A. Student Recruitment and Admissions

Discuss the unit's admission and recruitment processes (including transfer articulation(s)) and evaluate the impact of these processes on enrollment.

4.A.1 B.S. in Nuclear Engineering

The Engineering Student Success (ESS) Center, under School of Engineering, coordinates the recruitment of undergraduate students through events like SOE Open House, Senior Day, and outreach opportunities inside and outside the state of New Mexico. The NE faculty and staff work closely with ESS to enhance recruiting. Research opportunities, employment, and our close relationships with the national laboratories are highlighted during recruitment visits made by Steve Peralta of ESS. The Department of Nuclear Engineering has also taken the initiative to plan and host campus visits for students interested in the program. This includes scheduled meetings with faculty, staff, a student representative, teaching and research laboratory tours, and meeting with ESS staff.

Admission to the Engineering pre-major status is handled by the UNM Admissions office. Students applying to UNM must have a proposed major. If they choose an engineering major, they are placed into one of the pre-major categories including pre-nuclear engineering.

Admission to major status occurs when students have completed 19 credit hours of freshman year technical subjects required by the School of Engineering for admission, and a minimum GPA of 2.50 in those courses is required for admission to undergraduate study in Nuclear Engineering. A total of 26 credit hours applicable to a degree is required for admission with a cumulative GPA of at least a 2.20. All applicants must have completed ENGL 110 or its equivalent before admission into the major. All courses required in a Nuclear Engineering baccalaureate degree program must have grades of "C-" or better for satisfying both pre-admission and graduation requirements. For the Department of Nuclear Engineering, these courses must include 19 credit hours of the following: Calculus I (Math 162) (4), Calculus II (Math 163) (4), General Physics I (Phyc I) (3), CS151L (Computer Programming Fundamentals for Non-Majors) (3), Chem121 (General Chemistry I) (3), Chem123L (General Chemistry Laboratory I) (1), Chem122 (General Chemistry II) (3), Chem124L (General Chemistry Laboratory II) (1), and/or NE 101 (Introduction to Nuclear Engineering) (1).

Transfer students are handled similarly. Those who have not completed the required 18 hours before admission to UNM are placed into pre-major status by UNM Admissions. Those who have already completed the required hours with the required UNM GPA may be admitted directly into the degree program. If a student does not have a UNM GPA they will remain in pre-major status until the student establishes the required UNM cumulative GPA.

Starting in Fall 2017 and for admission into the NE Department, any course required for the BSNE cannot have been attempted more than three times. An attempt includes receiving any letter grade (A through F), WP, WF, W, WNC, CR, NC, I or AUDIT. For the purposes of this requirement, course work taken at other institutions is treated the same as course work taken at the University of New Mexico.

Once grades from the pre-admission courses become available, eligible students who have complete all requirements will be auto-admitted into the program and sent an admissions letter.

4.A.2 M.S. and Ph.D. in Nuclear Engineering

Graduate applicants apply for admission through the centralized university online system similar to undergraduate application. The decision, however, is made by the department. The departmental Graduate Committee, under the leadership of Director of Graduate Programs, reviews the credentials including past academic performance, statement of intent, GRE scores, and letters of recommendation. At times faculty members recruit their own desired students, mainly to work on externally funded research. The department then works with the faculty to admit the student. Admission to the Medical Physics MS program within NE follows the same process, once the applicant is determined to be admissible to the Nuclear Engineering department, admission into the Medical Physics program is made by the Medical Physics program faculty within both Nuclear Engineering and the medical school.

4B. Enrollment Trends, Persistence, and Graduation Trends

Provide an analysis of the unit's enrollment, persistence/retention, and graduation trends, including an explanation of the action steps or initiatives the unit has taken to address any significant challenges or issues highlighted in these trends.

The enrollment data for the three degree programs in Nuclear Engineering for the current and past eleven years are shown in Table 4.1. The numbers are based on the official record, tallied at the end of three weeks into each Fall semester. The numbers fluctuate, but there is a moderate increase in graduate enrollment at the Ph.D. level and a moderate decrease in graduate enrollment at the M.S. level.

Note that there is a dramatic jump in undergraduate enrollment from Fall 2015 to Fall 2016. Prior to Summer 2016, pre-majors were advised by the Engineering Student Success Center in SOE, and thus did not "belong to" the individual departments. Beginning in Summer 2016, SOE reorganized its advising process to more fully align with the UNM advising structure. Both pre-major students and students admitted to the major started to be advised by professional advisors and faculty within their intended department. The undergraduate enrollment numbers thus include both pre-majors and majors.

Table 4.1 Enrollment data since 2006.

B.S. Program Enrollment											
AY06	AY07	AY08	AY09	AY10	AY11	AY12	AY13	AY14	AY15	AY16	AY17
21	31	29	36	35	42	37	36	47	41	90*	94

M.S. Program Enrollment											
AY06	AY07	AY08	AY09	AY10	AY11	AY12	AY13	AY14	AY15	AY16	AY17
25	30	32	18	19	17	18	23	21	19	11	16
Ph.D. Program Enrollment											
AY06	AY07	AY08	AY09	AY10	AY11	AY12	AY13	AY14	AY15	AY16	AY17
17	17	19	18	21	25	37	34	30	30	30	30

* School of Engineering started to assign pre-majors to individual departments.

Table 4.2 shows the degree production for the three degree programs in Nuclear Engineering over the current and past eleven academic years. The increase in B.S. degrees awarded since 2014 correlates with the improving job market in the overall nuclear industry but also with the increased enrollments associated with the rebranding that came with the creation of the standalone Department of Nuclear Engineering. The vast majority of undergraduate students received their B.S. within three years after being admitted to the Nuclear Engineering major. The trend, as well as recent strategic actions implemented by the department (expanded recruitment efforts, hiring stellar faculty who establish well-funded research programs), indicates increasing enrollments at both undergraduate and graduate levels over the next several years.

Table 4.2 Graduation data since 2006.

B.S. Degrees Awarded											
AY06	AY07	AY08	AY09	AY10	AY11	AY12	AY13	AY14	AY15	AY16	AY17
12	8	12	7	10	7	12	11	7	16	16	13
M.S. Degrees Awarded											
AY06	AY07	AY08	AY09	AY10	AY11	AY12	AY13	AY14	AY15	AY16	AY17
10	4	8	8	9	4	9	8	6	12	10	4
Ph.D. Degrees Awarded											
AY06	AY07	AY08	AY09	AY10	AY11	AY12	AY13	AY14	AY15	AY16	AY17
2	0	3	4	0	2	3	4	4	5	1	6

4C. Advisement Process

Discuss the unit's advisement process for students, including an explanation of how the unit has attempted to improve or address issues regarding its advising practices (i.e. refer to the outcomes established by the Office of University Advisement, the unit's advising maturity scores—which can be obtained from the unit's designated academic advising, etc.).

As described in **Section 4A**, the Department is in charge of advising both pre-majors and majors.

There are two professional advisement staff members in the Department (primary Nuclear Engineering advisor and pre-major advisor). All pre-majors are advised by the staff advisors. The degree majors are advised by the primary Nuclear Engineering staff advisor and faculty advisors. Undergraduate students are assigned a faculty advisor when they are accepted into the Nuclear Engineering program, and the faculty member usually remains their advisor for their entire undergraduate career. The primary staff advisor will also serve as a resource from their freshman year until graduation. We feel that it is important to have the staff and faculty build a personal connection with the students. In addition, this allows the Department to provide effective advising by utilizing staff and faculty's unique and diverse expertise.

Throughout the pre-major advisement process, staff advisors set up academic plans, introduce them to the Nuclear Engineering program, assist in students understanding of the university policies, procedures, and functionality, and connect them to vital recourses. Although, pre-majors are not assigned to a faculty member, the department sets up specific events aimed to establish a positive relationship with the faculty. We found that this provides students with a smoother transition in the university and incorporates faculty advisement at the pre-major level.

During the major advisement process, the students and their faculty advisor discuss the student's academic history, their plans for subsequent semesters, their outside work load, and other areas that impact the student's progress through the program. The advisement process provides a good opportunity for the faculty member to get to know the students and for the student to discuss academic and career options.

Students are required to meet one on one each semester for advisement. Once advisement is completed notes are document and placed in their student file. This is documented by utilizing an online system called "LoboAchieve" and through Advisement forms.

Advisement forms are only done once they are admitted into the major. All pre-major advisement is documented in LoboAchieve. The advisement form is signed and dated by both the student and the faculty advisor. One copy of the form goes to the student and the other copy is placed in the student's file. After advisement, the student returns the file copy of the form to the staff advisor who removes the computer hold on the student's account. The student cannot enroll for classes until this hold is removed. Students are also encouraged to talk to their faculty advisor, staff advisor, or the Director of Undergraduate Programs anytime they have a question about their academic program.

NUCLEAR ENGINEERING

Undergraduate Advisement Form

Instructions to Student

STEP ONE: Complete the form below using your LoboWeb account, LoboTrax Degree Audit, UNM Catalog and degree requirement forms found at http://ne.unm.edu/.

STEP TWO: Take your completed form to your faculty advisor for review/approval.

STEP THREE: After your faucIty advisor has signed your form, take it to Krista Navarrette, NE Sr. Academic Advisor, in ME 436. Krista will then update your file folder, make any necessary edits to your degree audit and will remove your academic advisement hold.

Name:____________________ **UNM ID Number:**____________________

Catalog Year Used (i.e. Spring 2017):____________________ **Research Title or Focus:** ____________________

Estimated Graduation (Semester/Year):____________________ **Paid or Voluntary:**____________________

Degree GPA (located on your audit):____________________ **Research Dates:**____________________

Minor (optional):____________________ **Name & Affiliation:**____________________

Please use comment area to provide additional research information if needed. If you are not doing research put N/A above.

Current Semester Semester/Year: __________			Next Semester Semester/Year: __________	
Course	Credit Hrs.	Anticipated Grade	Course	Credit Hrs.

Questions/Comments/Concerns? Include any LoboTrax issues that need to be addressed.

____

____

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____

____

Student Signature:____________________ **Date:**____________________

Faculty Advisor Signature:____________________ **Date:**____________________

For Sr. Academic Advisor			
Degree Checklist:		Exceptions requests sent for Degree Audit	Comments
Hold Removal:			
Comments in LoboAchieve:			

4D. Student Support Services

Discuss any student support services that are provided by the unit and evaluate the relevancy and impact of these services on students' academic success.

The Department maintains a warm environment to ensure a close relationship between students and faculty and between students and staff. In addition to the broad advisement support provided by faculty and staff, the SOE Engineering Student Success Center (ESS) and UNM Center for Academic Program Support both offer tutoring services. ESS and UNM career Services also provide support in relation to Internships/Co-operative Education Program and employment. The UNM Graduate Resource Center also provides writing, statistics, and research support facilitated by peer consultations and workshops that help graduate students develop strategies to be effective academics, researchers, and professionals.

4E. Student Success and Retention Initiatives

Discuss the success of graduates of the program by addressing the following questions (1) Where graduates are typically placed in the workforce? (2) Are placements consistent with the program's learning goals? (3) What methods are used to measure the success of graduates? (4) What are the results of these measures?

Our Nuclear Engineering graduates successfully find employment within and outside the State, with primary employers being national laboratories, nuclear utilities and vendors, and federal agencies. Recent BS degree graduates have have been hired at Palo Verde Nuclear Plant (AZ), Westinghouse (PA), AREVA (WA), Urenco (NM), WIPP (NM), and the US Nuclear Regulatory Commission (Washington D.C.) but a significant number of our graduates choose to pursue graduate studies. Our top students routinely receive offers from, and attend, top ranked Nuclear Engineering graduate programs including MIT, U. Michigan, U.C. Berkeley, U. of Illinois Urbana-Champaign, and N.C. State, but several opt to stay with the Department for their graduate degrees.

The Department faculty are very research active and support a significant number of graduates students. The vast majority graduate with PhD degrees and most receive employment offers within state, from Sandia National Labs, Los Alamos National Lab and local consulting companies (Leidos, Omicrom, XL Scientific), while others have left the State to pursue opportunities at Idaho National Lab and Oak Ridge National Lab. The demand for our students from employers across the spectrum of the nuclear enterprise, which is a direct result of a healthy education and research culture among the faculty, is a testament to the quality of the nuclear engineering program.

4F. Student Strategic Planning

Discuss the unit's strategic planning efforts going forward to improve, strengthen and/or sustain its structures, processes, and/or rates for recruiting, retaining, and graduating students.

Strategic planning to constantly review, assess and improve the program processes and structures to benefit students is undertaken on a regular basis: during faculty meetings that are held every two weeks, during the annual department retreat, and by engaging the department's Advisory Council during their annual on-campus gathering.

Undergraduate recruitment efforts are coordinated with the Engineering Success Center (ESS) at the School of Engineering and consist of participation in summer Open House activities, visits to local high school, and by mailing promotional material. In conjunction with the ESS, the department is planning a major recruitment drive to target high schools in SE New Mexico, a region that is the home to nationally vital nuclear fuel cycle industry (uranium enrichment, waste disposal) but underserved in college level nuclear science and engineering education. We are also planning broader recruitment drives in the Western US States that provide limited access to comprehensive university programs in nuclear science and engineering.

With a growing numbers of research active faculty, the demand for graduate students is increasing annually, requiring active graduate recruitment efforts by the department. Our efforts include: maintaining an informative and easy to navigate website, creating and disseminating brochures that showcase faculty research productivity and highlight funding awards from competitive Federal research programs, and having a visible presence at major national and international conferences. Faculty members also reach out to students directly when giving invited seminars at peer institutions.

Criterion 5. Faculty

The faculty (i.e., continuing, temporary, and affiliated) associated with any of the unit's degree/certificate program(s) should have appropriate qualifications and credentials. The faculty should be of sufficient number to cover the curricular requirements of each degree/certificate program. Also, the faculty should be able to demonstrate sufficient participation in relevant research and service activities. (If applicable, differentiate for each undergraduate and graduate degree and certificate program offered by the unit.)

5A. Faculty Composition and Credentials

After completing the Faculty Credentials Template discuss the composition of the faculty and their credentials. Include an overall analysis of the percent of time devoted by each faculty to the relevant degree/certificate program(s) and his/her roles and responsibilities.

The completed Faculty Credentials Template is shown in Appendix A. All regular faculty (4 tenured, 2 tenure-track, and 1 lecturer) in the department have a doctoral degree in nuclear engineering or a closely related field and have a record of research/scholarship. Currently all but one faculty are highly research active, with the exception focused more on teaching. The department does not distinguish between undergraduate and graduate teaching faculty. All faculty share the teaching responsibilities for our BS, MS, and PhD programs. The department has one affiliated faculty from the School of Medicine, who teaches specialized courses for the Medical Physics MS Concentration, and one UNM-National Lab Professor who teaches a core undergraduate course on Monte Carlo, advises graduate students, and collaborates with faculty on research projects. Because of the small faculty size, the department relies on 2 – 3 Adjunct faculty each year to teach upper-level and graduate classes.

5B. Faculty Course-Load

Explain the process that is utilized to determine and assign faculty course-load. Discuss the efficiency of this process (i.e., how does the unit determine faculty assignment to lower division vs. upper division courses). Include an analysis of faculty-to-student ratio and faculty-to-course ratio (based on the total number of credit hours taught).

The School of Engineering Academic Load Policy, that was adopted in May 2014 and is shown in Appendix B, assigns teaching loads based on a faculty member's tenure status, level of research productivity, and administrative activity. Most faculty with an active and funded research program teach three courses per year, with the exception being Assistant Professors prior to the Mid-Probationary mark (i.e., in the first three years of their position) who teach two courses.

Engineering students normally spend their first one to two years taking basic science and math courses, so there are few lower-division Nuclear Engineering courses. There is very little variation in sizes of upper-division classes for which, because of the small size of the department, the faculty-to-student ratio is small and around 1: 7. Currently our upper-division class size is around 15 – 18 students per class and 6 – 10 students per graduate class. We have a significant number of graduate students at Los Alamos who take classes through UNM's Distance Learning facilities which helps sustain enrolment in our classes. The department promotes a balanced teaching responsibility at undergraduate and graduate levels, with each faculty member encouraged to teach at least one graduate class per year in their area of interest.

5C. Faculty Professional Development

Discuss and provide evidence of the professional development activities for faculty within the unit including how these activities particularly have been used to sustain research-related activities, quality teaching, and support students learning and professional development at the undergraduate and graduate level.

The Department supports faculty development in teaching through regular peer assessment of classes, student feedback in annual exit interviews with the Chair for each year, and mentorship by faculty who are recognized outstanding teachers. The Chair gets an opportunity to formally address teaching weaknesses during the Annual Review, that is mandated by the University, and encourages the relevant faculty member to formulate specific action plans to improve. The formal review provides an incentive for faculty to take concrete steps in addressing teaching weaknesses as the Chair's assessment and the faculty member's response is submitted to the Dean and revisited the following year. Additionally, the Center for Teaching and Learning (CTL) at UNM offers both individual and departmental consultations on teaching effectiveness. CTL also offers collaborative peer observations of teaching as well as numerous workshops on diverse aspects of teaching.

Each Assistant Professor is mentored by an established tenured Senior faculty member, who is encouraged to meet regularly with the mentee to offer specific and general advice and guidance on teaching, research and general professional development. The mentor is encouraged to express his/her concerns to the Chair in case preemptive action is necessary to prevent concerns from developing into serious problems.

All faculty members are encouraged to sustain funded research programs that support multiple graduate students, possibly staffed by postdocs and Research Professors, and demonstrate steady scholarly productivity in the form of journal publications, conference attendance and presentations, giving invited seminars at peer institutions, and established collaborations with researchers at other institutions including national labs and industry. The faculty are expected to be active in professional societies, becoming candidates for elected positions in their respective divisions. The department encourages high research activity to promote the visibility of the faculty member and enhance the its own reputation. As such, resources are provided for the faculty member to succeed in these endeavors, including adequate office and laboratory space (this invariably requires assistance from the Dean of Engineering), computing resources, graduate student recruitment, and inviting speakers for the graduate seminar series. Although faculty support their conference and related professional travel on their contracts and grants, the department will provide such support during emergencies and depending on the nature and purpose of the travel.

During the tenure year, the Department's Promotion and Tenure Committee helps the faculty member prepare his/her dossier per University guidelines and provides a written assessment of the candidate's portfolio to the entire faculty. Although not required to make a formal recommendation, the P&T Committee does serve in an advocacy role to ensure the strongest possible case is made for tenure.

5D. Faculty Research and Creative Works

Discuss and provide evidence of the research/creative work and efforts of the faculty within the unit at the undergraduate and graduate level. Explain the adequacy and/or significance of the research/creative work and efforts in supporting the quality of the unit and/or the program(s).

Section 5F includes all regular faculty's short CVs, which provide a good summary of recent research efforts and accomplishments. Our faculty are very research active and the junior faculty in particular have experienced stellar recent success in securing research funding from highly competitive Federal research programs: In 2017, these individuals were awarded a total of $3 million by the DOE-NEUP program and NRC.

In general, the department has active research programs in the following technical areas:

(i) Radiation damage in nuclear materials; accident tolerant nuclear fuels development; nuclear fuel simulation

(ii) Thermal hydraulics of terrestrial and space nuclear power systems; thermal propulsion; reactor safety; small modular reactor design

(iii) Radiation detection and instrumentation for nuclear nonproliferation and safeguards; fusion neutron diagnostics; fundamental fission fragment measurements

(iv) Deterministic and Monte Carlo methods in radiation transport with application to reactor physics and criticality safety; sensitivity analysis and uncertainty quantification in nuclear systems; random neutron population modeling.

The department generated research expenditures of $1,351,064 in 2017, which averages to $225,177 per FTE faculty member (the denominator includes one research-inactive faculty member). The faculty published a total of 19 refereed journal articles, 10 conference proceedings and filed 4 patents during 2017. The senior faculty have won multiple national honors and awards, details of which may be found in their CVs.

5E. Faculty Involvement in Student Retention and Academic Success

Explain and provide evidence of the efforts and strategies by the unit to involve faculty in student retention and ensure students' academic success at the undergraduate and graduate level (i.e., advising efforts, student engagement activities, etc.)

As described previously, the degree majors are advised by both the staff and faculty advisors. Undergraduate students are assigned a faculty advisor when they are accepted into the Nuclear Engineering program, and this faculty member usually remains their advisor for their entire undergraduate career. During the advisement process, the students and their advisor discuss the student's academic history, their plans for subsequent semesters, their outside work load, and other issues that impact the student's progress through the program. The advisement process provides a good opportunity for the faculty member to get to know the students and for the student to discuss academic and career options with a faculty member.

Graduate students are matched to faculty advisors depending on mutual interest and available research funding to support graduate assistantships. Advisement is mainly done through direct interaction with the faculty advisor, although the staff advisors also help with paperwork and record keeping for graduate students. Students are also encouraged to talk to the Director of Graduate Programs about their academic progress.

Department faculty members also serve as faculty advisors for the student chapters of professional organizations including American Nuclear Society (ANS) and the Institute of Nuclear Materials Management (INMM), and are frequently involved in their activities.

5F. Faculty Experience

Provide an abbreviated vitae (two pages or less) or summary of the educational background and professional experiences of each faculty member. (If the unit has this information posted on-line, then provide links to the information.

Short curriculum vitaes of the 7 regular faculty in Department of Nuclear Engineering can be found in Appendix E, p. :

5G. Faculty Strategic Planning

Discuss the unit's strategic planning efforts going forward to improve, support, and/or optimize its faculty.

Following the creation of the standalone Department of Nuclear Engineering, accompanied shortly by the retirement of two long serving faculty members (one Associate Professor and one Principal Lecturer) and the more recent loss to industry of a productive Assistant Professor, we undertook strategic planning exercises to not just stabilize the department but to position it for future success. Two junior faculty were hired in Fall 2016 in what we had determined to be a strategic area of nuclear materials and fuels. These faculty have had an immediate and outstanding impact on the department's education and research mission, bringing youthful energy and creativity to the classroom, building and equipping state-of-the-art research laboratories, hiring significant numbers of graduate students pursuing doctoral research and undergraduate students gaining research experience. Their rapid success has brought positive external attention from stakeholders and peer institutions, which should enhance the department's reputation. In Fall 2017, we hired a junior Lecturer who became the first female faculty member in the department. After another strategic planning exercise in August 2017 to determine the next growth area for the department, we undertook another successful search that netted what we hope is third stellar junior faculty member, in the reactor physics and criticality safety area, who will join the department in Fall 2018. Given several years of State budget cuts that have limited growth at UNM, we do not expect to be able to add new faculty members for the foreseeable future but the department is presently in a good position and yet to achieve maximum effect of the hires over the last three years. The focus will shift towards ensuring the development, promotion, and retention of this outstanding crop of faculty, by effective mentoring, manageable workload, and rewarding their success through increase in compensation. This, and increasing undergraduate and graduates enrollments, will be the subject of our next strategic planning exercise at the upcoming faculty retreat in August 2018.

Criterion 6. Resources and Planning

The unit has sufficient resources and institutional support to carry out its mission and achieve its goals.

6A. Resource Allocation and Planning

Explain how the unit engages in resource allocation and planning that are effective in helping it carry out its mission and achieve its goals. If the unit has an advisory board, describe the membership and charge and discuss how the board's recommendations are incorporated into decision-making. Include a discussion of how faculty research is used to generate revenue or apply for grants. How is the revenue gained from research being distributed to support the unit and its degree/certificate programs?

Resource allocation and planning is conducted primarily by the Department Chair, in consultation with the Associate Chair and Directors of the Graduate and Undergraduate programs. The department has an active Advisory Council which, as of Fall 2017, consists of 11 members representing a cross section of government labs, industry and academia. Some of the members are also alumni of our department. The Advisory Council makes programmatic recommendations and provides advice as well as acts as our community advocate, so the Council is rarely involved in resource allocation and planning issues.

As described in other sections, the NE Department is active in research. The revenue generated by faculty research is directly used to support the research enterprise, namely graduate research assistantships, post-docs, faculty summer salaries, equipment, professional travel, and other necessary expenditures for conducting the research. A portion of the indirect costs (overhead) generated by external funding is returned to the department. The percentage of the generated indirect costs returning to the department varies from 0 to about 15% in recent quarters since it follows the top slice model. This is the same model used by the VPR, wherein all fixed costs and those important to the administration are covered first, then if money is left over, it trickles down to the department. The PI gets a share of the F&A return in quarters when funds are received by the department.

6B. Budget and Funding

Provide an analysis of information regarding the unit's budget including support received from the institution and external funding sources. Include a discussion of how alternative avenues (i.e., external and grant funding, summer bridge programs, course fees, differential tuition, etc.) have been explored to generate additional revenue to maintain the quality of the unit's degree/certificate program(s) and courses.

The department receives about $1.03M direct Instruction & General (I&G) funds annually. Because of cuts and mid-year pull-backs over the past two years, the I&G funding is inadequate to cover all salaries (faculty, staff, TA/graders, and adjunct faculty). Some TA/graders and part-time adjunct faculty salaries come from undergraduate and graduate differential tuition (totaling approximately $40K per year flowing back to the department). The department also receives curriculum fees of about $22K per year. This is our main source for upgrading and maintaining teaching laboratories, as well as for computer hardware and software purchases. External research/educational expenditures by our faculty amounted to $1,351,064 in FY 2017. As described in Sec. 6A these funds are used for supporting graduate students, post-docs, faculty summer salaries, equipment, supplies, travel, and miscellaneous research expenses

6C. Staff Composition and Responsibilities

Discuss the composition of the staff assigned to the unit and their responsibilities (including titles and FTE). Include an overall analysis of the sufficiency and effectiveness of the staff in supporting the mission and vision of the unit.

The departmental staff includes 5 members some of whom are shared with the Department of Chemical and Biological Engineering. The positions and their main responsibilities are:

- Department Administrator (1.0 FTE) – supervision of staff; administrative processes relating to hiring, faculty contracts, course scheduling, department office operation etc.
- Administrative Assistant (0.5FTE) – assistance to department chair, faculty and department administrator, shared with CBE
- Senior Academic Advisor (1.0 FTE) – undergraduate and graduate student advisement
- Accountant 2 (0.5 FTE) – budgets, accounting, and related matters, shared with CBE
- Engineering Tech (1.0 FTE) – laboratory technical support and inventory

The department staff work effectively with each other and form an efficient team in supporting the vision and mission of the department. Given the relatively small size of the department, the support services provided by the present makeup of the staff is sufficient.

6D. Library Resources

Discuss and provide evidence of the adequacy of the library resources that are available and/or utilized to support the unit's academic and research initiatives.

The University Libraries system at UNM is comprised of four libraries: Centennial Science and Engineering Library, Fine Arts and Design Library, Parish Memorial Library for Business and Economics, and Zimmerman Library. University Libraries is a member of the Association of Research Libraries, an organization of the largest research libraries in North America, HathiTrust Digital Library, Center for Research Libraries, Greater Western Library Alliance, New Mexico Consortium of Academic Libraries and other groups. The University Libraries also serves as the regional depository of federal government publications for the state of NewMexico.

The University Libraries has an extensive collection that is adequate to support student and faculty needs. Books, magazines, newspapers, and scholarly journals make up a substantial portion of the collections, but many other formats of information are included. Many parts of the collections are now available beyond the walls of any library in online digital formats. The acquisition of these materials accelerates with each year, now surpassing print and other tangible formats in terms of the number of titles available. A wide selection of ejournals, ebooks, digital music, and streaming video are available to all UNM students, faculty, and staff. The University Libraries also leads the nation in developing processes to curate, store, and preserve research data created by UNM faculty and students and make it available to the world.

UNM collaborates with many libraries in the U.S. to expand the availability of information. Cooperative initiatives include interlibrary loan, cooperative purchase of electronic resources, and shared preservation and digitization projects.

The University Libraries has also designated an Engineering Librarian who is familiar with the needs of the Nuclear Engineering Department. This is the point of contact for faculty wanting to order new books or journal subscriptions.

6E. Resources and Planning Strategic Planning

Discuss the unit's strategic planning efforts going forward to improve, strengthen, and/or sustain the sufficient allocation of resources and institutional support towards its degree/certificate program(s), faculty, and staff.

As described above, the primary source of funding for the department comes from university I&G allocations, which is based on overall enrollments and graduation rates at the university. Recent State revenue shortfalls have resulted in budget cutbacks and midyear rescissions and recovery of these cuts is not expected despite the improved outlook in the financial health of the State. Increased enrollment is the only way to raise our I&G funds, and this is a priority for the School of Engineering and, as mentioned earlier, is a strategic goal of the NE Department going forward. The establishment of both undergraduate ($15/cr hour) and graduate ($100/cr hour) differential tuition has provided some relief, although with the relatively low enrollments in nuclear engineering the amount generated is not large enough to make serious strategic investments. These funds do help cover costs associated with Adjunct Faculty, graders and tutors, proving to be a vital resource in the absence of dedicated TA lines. Funding raising through alumni outreach, and by the UNM Foundation on behalf of the department, has enabled the creation of undergraduate scholarships and awards. The Dean of Engineering is engaged in a more aggressive fund raising drive and has asked all SOE Departments to support his efforts.

Criterion 7. Facilities

The facilities associated with the unit are adequate to support student learning as well as scholarly and research activities.

7A. Unit's Allocated Facilities

Provide an updated listing from UNM's current space management system of the spaces assigned to your unit. Discuss the evolution and sufficiency of the amount of space your unit has been assigned by category (e.g., offices, support spaces, conference rooms, classrooms, class laboratories, computing facilities, research space, specialized spaces, etc.). (1) Include an analysis of the square footage-to-student ratio and square footage-to-faculty ratio. (2) Explain if the unit has any spaces outside or in other locations that are not documented in UNM's space management system.

Nuclear Engineering has faculty, staff and student offices in the newly remodeled Farris Engineering Center, teaching and research laboratories as well as RA offices in Centennial Engineering Center, and one lab in the Mechanical Engineering building. Additionally, the Nuclear Engineering Laboratory houses the department's teaching and training nuclear reactor as well as laboratories for multiple radiation measurements classes and one hot materials testing research facility that is under development.

Farris Engineering Center Building # 119	Area (Sq. Ft)
Administrative Space (includes conference rooms)	1429
Faculty Offices	1504
Student / Collaborative Space (includes computer lab, student office space)	2848
Centennial labs	3002
ME lab	980
Nuclear Engineering Lab	4171

The new student lounge is equipped with whiteboard walls, a large screen and projector for holding meetings, for example with recruiters, or for the student chapters. In addition, we have two dedicated student conference rooms with 4K 65 inch LCD monitors. There is also one study room for discussions and a similar one for faculty-student meetings. There is a kitchen, a break area and lockers for the professional society student chapter use. Students have access to a 800 sq. ft. computer lab with a 75" 4K monitor for presentations, 12 computer workstations and laptop ready desks for collaborative work. The department also as access to a large conference room, equipped with a 84" 4K LCD monitor, two PTX cameras for videoconferencing, and AirMedia system for wifi enabled presentations and a state-of-the-art sound system is available for department use. Department faculty meetings, Advisory Council meetings and occasional seminars are held in this conference room. Appendix C shows the floor plans for each floor that the department conducts business.

7B. Ability to Meet Academic Requirements with Facilities

Discuss the unit's ability to meet academic requirements with the current facilities. Explain the unit's unmet facility needs. If applicable, describe the facility issues that were raised or noted in the last APR. What were the outcomes, if any?

Classrooms are assigned via a centralized university scheduling system but there are no classrooms in Farris Engineering Center. All NE classes are taught in buildings scattered on main campus but primarily in the Mechanical Engineering Building, Centennial Engineering Center, and Dane Smith Hall. Teaching labs are located in Centennial Engineering Center and in the Nuclear Engineering lab. Although available space is adequate at present, the department will outgrow the available laboratory space in the NE Lab as enrollments increase and the demand for more experimental stations increases. Additional sections is not necessarily the solution as this will impact scheduling and faculty workload.

7C. Space Management Planning Efforts

Discuss any recent space management planning efforts of the unit relative to the teaching, scholarly, and research activities of the faculty associated with the unit. Include an explanation of any proposed new initiatives that will require new or renovated facilities.

Although we do not have need for additional laboratory space at present, future growth of experimental programs will require significant fundraising to build out and equip the basement of the Farris Engineering Center. This is a long term plan but in the short term we would like to move a NE faculty member's materials research lab from its currently location in the ME building to the Farris basement. We have asked the Dean for help in acquiring the space but have been notified that the department will have to raise the necessary funding.

7D. Unit Facility Goals and Strategic Planning

Discuss the unit's facility goals and priorities for the future and the timelines associated with them. Include a description of short-term goals (1 – 3 years) (e.g. renovation requests) and long-term goals (4 – 10 years) (e.g. new facilities) and how they align with UNM's strategic planning initiatives. Explain the funding strategies associated with any of the unit's facility goals.

The renovated Farris Engineering Center has provided the NE Department sufficient contiguous space along the East side of the building for the present and foreseeable future. However, the need to find additional faculty and RA office space could become a reality with further growth of the department.

Criterion 8. Peer Comparisons

The degree/certificate program(s) within the unit are of sufficient quality compared to relevant peers. (If applicable, differentiate for each undergraduate and graduate degree and certificate program offered by the unit.)

8A. Unit's Distinguishing Characteristics

Discuss the distinguishing characteristics of the degree/certificate program(s) within the unit after completing the Peer Comparison Template provided as Appendix H (i.e., examination of student enrollment rates, degrees/certificates offered, number of tenure-track faculty, research/creative work of faculty, etc.). Include an analysis of the unit's degree/certificate program(s) based on comparisons with similar or parallel programs: (1) at any of UNM's 22 peer institutions; (2) at other peer institutions identified by the unit; and (3) designated by relevant regional, national, and/or professional agencies.

Appendix D lists the comparison of our department with other NE departments at peer institutions, comparing enrollment, degrees offered, faculty size, and US NWR rankings. There are approximately 25 US nuclear engineering programs that are ranked and our peers comprise a mixture of comparable sized programs and larger programs with which we are competitive or which we regard as aspirational. Note that UNM has the only nuclear engineering program in the State of New Mexico and one of only three West of Texas that offers BS, MS and PhD degrees in the discipline (UC Berkeley and Oregon State University being the other two). Our US NWR ranking is 18, but although our faculty size puts us at a position that is consistent with other programs of comparable size, our own assessment is that our reputation exceeds that of some institutions that are ranked above us, in particular Kansas State University and University of Texas, Austin, neither of which offer undergraduate degrees in NE. Name recognition, both of the institution and the department, are major factors in the determination of US NWR rankings. While the NE faculty cannot directly impact the institutional reputation, our recent success in hiring outstanding junior faculty who have rapidly established productive research enterprises should have a positive impact on department's reputation relatively soon. However, the fact remains that we are a very small department (6 tenure stream professors and 1 lecturer) and, as is well known, department size directly correlates with ranking.

8B. Strategic Planning in Relation to Peer Institutions

Discuss the unit's strategic planning efforts going forward to improve, strengthen, and/or sustain the quality of its degree/certificate program(s) in relation to peer institutions.

In the absence of faculty hiring opportunities over the next few years because of budget restraints the department will focus on increasing graduate enrollments to project growth, as well as advertise faculty and student accomplishments more extensively through brochures, increased conference attendance, and securing invitations to present seminars at peer institutions. We feel if Chairs and Deans at peer institutions were made aware of the quality of our program, faculty, and students, our ranking should increase by a couple of spots.

Appendix A

APR Criterion 5: Faculty Credentials Template

Directions: Please complete the following table by: **1**) listing the full name of each faculty member associated with the designated department/academic program(s); **2)** identifying the faculty appointment of each faculty member, including affiliated faculty (i.e., LT, TTI, TTAP, AD, etc.); **3**) listing the name of the institution(s) and degree(s) earned by each faculty member; **4)** designating the program level(s) at which each faculty member teaches one or more course (i.e., “X”); and **5)** indicating the credential(s) earned by each faculty member that qualifies him/her to teach courses at one or more program levels (i.e., TDD, TDDR, TBO or Other). Please include this template as an appendix in your self-study for Criterion 5A.

Name of Department/Academic Program(s): Department of Nuclear Engineering

NOTE: Please add rows to the table as needed.

Full First and Last Name	**Faculty Appointment** Continuing Lecturer (LT) Probationary/Tenure Track - Instructor (TTI) or Asst. Prof. (TTAP) Tenured - Assoc. Prof. (TAP), Prof. (TP), or Dist. Prof. (TDP) Prof. of Practice (PP) Temporary Adjunct (AD) Term Teacher (TMT) Visitor (VR) • Research Faculty (RF)	**Institution(s) Attended, Degrees Earned, and/or active Certificate(s)/Licensure(s)** (e.g., University of New Mexico—BS in Biology; University of Joe Dane—MS in Anthropology; John Doe University—PhD in Psychology; CPA License—2016-2018)	**Program Level(s)** (Please leave blank or provide "N/A" for each level(s) the faculty does not teach at least one course.)		**Faculty Credentials** • Faculty completed a terminal degree in discipline/field (TDD); • Faculty completed a terminal degree in discipline/field and have a record of research/scholarship in discipline/field (TDDR); • Faculty completed a terminal degree outside of discipline/field but earned 18+ graduate credit hours in the discipline/field (TDO); OR • Other (Explain)
1.Neven Ali	LT	Missouri University of Science & Technology – PhD in Nuclear Engineering	Undergraduate Graduate Doctoral	X X X	TDDR
2.Osman Anderoglu	TTAP	Texas A&M University – PhD in Materials Science and Engineering	Undergraduate Graduate Doctoral	X X X	TDO
			Undergraduate	X	TDDR

3.Cassiano De Oliveira	TP	University of London – PhD in Nuclear	Graduate	X	
			Doctoral	X	
4.Mohamed El-Genk	TDP	University of New Mexico – PhD in Nuclear Engineering	Undergraduate	X	TDDR
			Graduate	X	
			Doctoral	X	
5.Adam Hecht	TAP	Yale University – PhD in Physics	Undergraduate	X	TDO
			Graduate	X	
			Doctoral	X	
6.Youho Lee	TTAP	Massachusetts Institute of Technology – PhD in Nuclear Engineering	Undergraduate	X	TDDR
			Graduate	X	
			Doctoral	X	
7.Anil Prinja	TDP	University of London – PhD in Nuclear Engineering	Undergraduate	X	TDDR
			Graduate	X	
			Doctoral	X	

Appendix B

Academic Load Policy
School of Engineering
University of New Mexico

Passed by vote of the SOE Faculty Assembly, May 9, 2014

1. Introduction

Section *C100: Academic Load* of the UNM Faculty Handbook articulates a policy governing the officially recognized duties carried out by faculty. These duties fall into the three familiar categories of teaching, scholarly work, and service. This policy and the closely related *C110: Teaching Assignments* policy wisely provide uniform guidelines across Academic Affairs, while recognizing that the overall academic load can be achieved by different mixes of teaching, research, and service to accommodate the diverse character and needs of individual units. This School of Engineering Academic Load Policy comprises uniform guidelines across the departments within the School, while taking full advantage of the flexibility articulated in Section *C100* to enable the breadth of the School's academic mission.

The SOE Academic Load Policy supersedes the SOE Teaching Load Policy approved by the SOE faculty on November 25, 2011. Among other features, the SOE Academic Load Policy is directed towards:

- enhancing sponsored research activity by SOE faculty
- encouraging the generation and commercialization of intellectual property emanating from research
- giving incentives for faculty to support additional graduate students, particularly at the PhD level
- providing a flexible approach for determining the appropriate teaching load for faculty, in light of their research and service activities
- establishing a mechanism for faculty to decrease their teaching load and increase their research load by using research funding to compensate their departments
- providing flexibility for department chairs to implement this policy in the best interests of their departments

2. Guidelines and Parameters for Balancing Teaching and Research for Regular Faculty with Full-Time Appointments

The guidelines and parameters in this section assume a normal university and professional service load, and articulate two faculty categories as follows:

(1) Faculty whose academic activities are centered on teaching, defined as:

- having less than $50k of annual research expenditures (as calculated in Section 5), and
- supervising fewer than 3 PhD students (as established in Section 6), and
- having no issued US patent in the previous two calendar years.

The base teaching load for faculty in this category will be 5 or 6 classes per year, depending on the level of service or other relevant considerations, as determined by the department chair.

(2) Faculty whose academic activities include a significant level of research, defined as:

- having more than $50k or more of annual research expenditures (as calculated in Section 5), or
- supervising 3 or more PhD students (as established according to Section 6), or
- having 1 or more issued US patents in the previous two calendar year, or
- demonstrating scholarly impact through significant peer-reviewed publications in the previous calendar year.

The base teaching load for faculty in this category will normally be 4 classes per year.

A faculty member in this category has the option of reducing his/her base teaching load to 3 courses per year by either:

- supervising 6 or more total graduate students (PhD + MS), or
- having a significant departmental administrative appointment with approval by the department chair, or
- having a significant administrative appointment within SOE with approval by the dean

In all cases, for faculty members with a 0.75 FTE or greater appointment, the base teaching load will not be reduced below 3 courses per year.

A faculty member may reduce his/her teaching load by using research or other funding to compensate his/her department at a level that is normally 15% of the academic year salary for each unit of course reduction. Such "release time" funds will remain in the faculty member's department to be managed by the department chair.

A faculty member who wishes to reduce his/her teaching load below 1 course/year must have approval of the department chair.

3. **Guidelines and Parameters for Balancing Teaching and Research for Regular Faculty with less than Full-Time Appointments**

For faculty members with less than full-time appointments, the base teaching loads in Section 2 will be adjusted in proportion to the fraction of the appointment. For example, faculty members having 0.5 FTE appointments within the School or having a 50% administrative appointment within the School would have base teaching loads that are one half of those in Section 2.

Administrative appointments within the School that are at the level of 50% include:

- Department chair
- Associate Dean for Academic Affairs
- Associate Dean for Research

In all cases in which the base teaching load is reduced for a reduced FTE or administrative appointment, the guidelines for further course load reduction through release time funding remain the same as those in Section 2.

University policies on parental and medical leave take precedence over the School's Academic Load Policy.

4. **Procedure for Establishing Faculty Base Teaching Load**

The base teaching load for each faculty member will normally be established by the department chair each January for the following academic year. For example, for calendar year 2015, the determination will be made in January 2015 for the 2015-16 academic year, which will start in August, 2015. The determination of the faculty member's research expenditures and graduate student supervision will follow the procedures in Sections 5 and 6, respectively.

It is in the interests of the School to implement this Academic Load Policy in academic year 2014-15, to the extent possible. With this in mind, the base teaching load for each faculty member will be established by the department chair as soon as possible after the Policy goes into effect. It is recognized that teaching assignments will have already been made by that time for the fall 2014 semester and may be difficult to change in many cases. Department chairs are encouraged to take advantage of whatever flexibility they may have to follow the new policy, with full implementation coming in the spring 2015 semester.

5. **Determination of Annual Research Expenditures**

For the purposes of Section 2, annual research expenditures will be determined from research expenditure reports provided by the School to each department based on research expenditures made in a faculty member's "org code" as the greater of:

- research expenditures for the previous calendar year, or
- the average of research expenditures for the previous 2 calendar years.

6. **Determination of Graduate Student Supervision**

For the purposes of Section 2, the number of graduate students supervised will be the number of graduate students (PhD or PhD + MS, depending on the criteria in Section 2) supervised at the end of the fall semester of the previous calendar year, plus any additional supervised students who have graduated during the previous calendar year. This determination will be made by the department chair.

7. **Further Guidelines**

In addition to what is articulated above, other circumstances may occur wherein it is in the interests of a department to reduce a faculty member's teaching load. For example, a reduced teaching load is often part of a new faculty member's startup package or part of "matching funds." All such cases will require approval by the department chair. As well, there may be additional circumstances in which it is in the interests of the School to reduce a faculty member's teaching load. Cases that fall into this category will require approval by the dean.

Each case will be decided on the basis of its own merits, with attention to the goals articulated in Section 1, and consistent with the spirit of the overall policy.

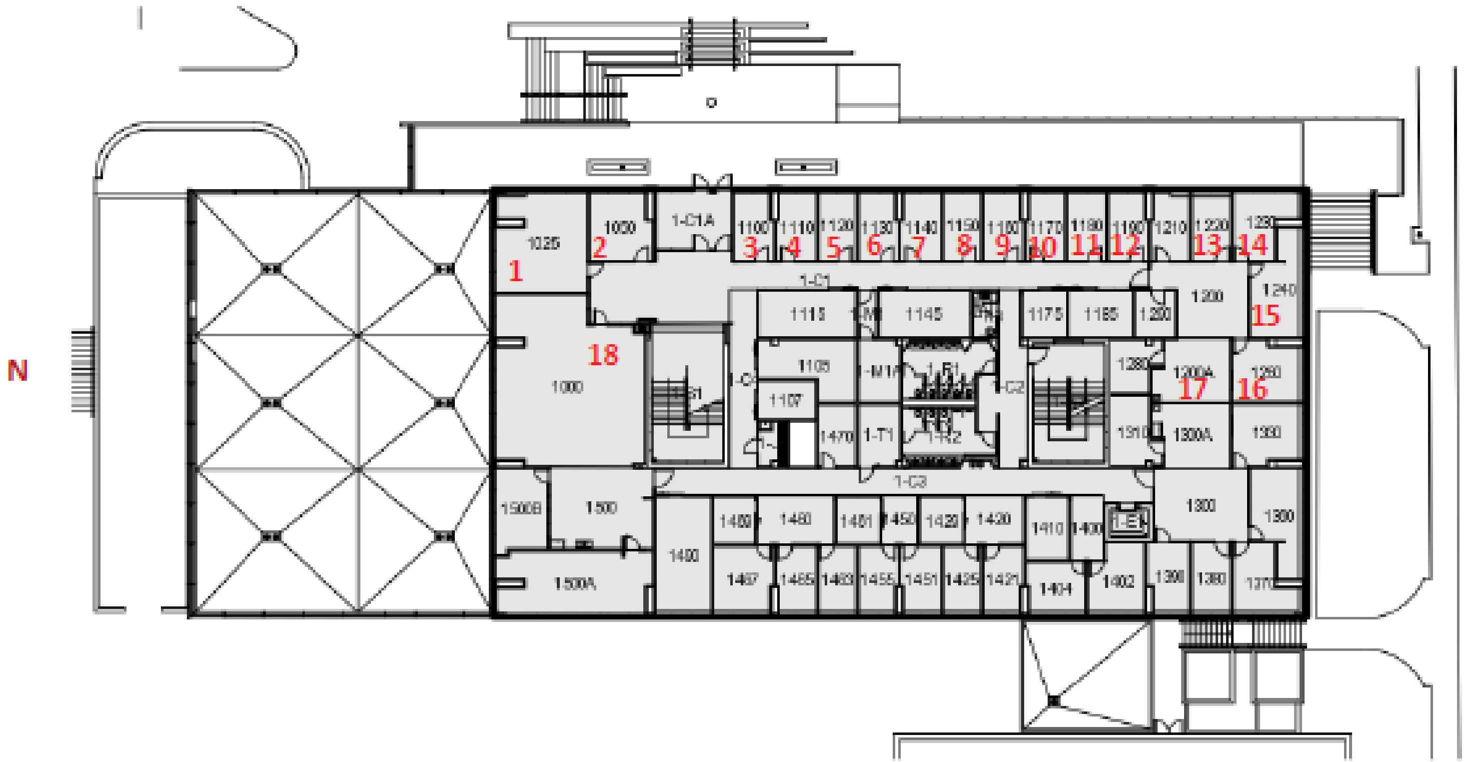
Appendix C

Nuclear Engineering Building Floor Plans

Centennial Engineering Center Basement

Legend:
1. Research lab
2. Research lab
3. Research lab
4. Research students
5. Research students

Farris Engineering Center First Floor



Legend:

1. Study
2. Emeritus faculty
3. Research faculty
4. Adjunct faculty
5-12. Faculty
13. Staff
14. Staff
15. Conference
16. Chair
17. Administration
18. Student lounge

Farris Engineering Center Second Floor

N

Legend:
1. Conference room
2. Computer lab

Mechanical Engineering First Floor

N

Legend:

1. Research lab

APPENDIX D

PEER COMPARISON

We have included 9 peer institutions, most offering undergraduate and graduate programs in Nuclear Engineering but some have only graduate programs. Note, UNM is only university in the State of NM that offers degrees in Nuclear Engineering, hence NM State and NM Tech are not included in the peer comparison.

	Total University Enrollment	Unit Undergraduate Degrees/Certificates Offered	Unit Undergraduate Student Enrollment	Unit Graduate Degrees/Certificates Offered	Unit Graduate Student Enrollment	Total # of Unit Faculty	Status/Ranks/ Comparisons (i.e., program goals, curriculum, faculty, and students, etc.)	Other (U.S. News 2018 Ranking: Best Graduate Schools – Mechanical Engineering)
University of New Mexico	26,278	• BS	• 9 4	• MS • PhD	MS 21 PhD 30	7		18
Ohio State University	51,869	• BS(ME)	• 577	• MS • PhD	MS 15 PHD 29	8		14
Oregon State University	14,432	• BS	• 214	• MS • PhD	MS 81 PHD 33	14		11
Missouri Univ. of Sci. &Tech	62,803	• BS (CHE?)	• 115	• MS • PhD	MS 12 PHD 20	14		19
Penn State University	36,996	• BS	• 133	• MS • PhD	MS 13 PHD 82	13		9
Purdue University	51,525	• BS	• 73	• MS • PhD	MS 25 PHD 25	17		11

	Total University Enrollment	Unit Undergraduate Degrees/Certificates Offered	Unit Undergraduate Student Enrollment	Unit Graduate Degrees/Certificates Offered	Unit Graduate Student Enrollment	Total # of Unit Faculty	Status/Ranks/ Comparisons (i.e., program goals, curriculum, faculty, and students, etc.)	Other (U.S. News 2018 Ranking: Best Graduate Schools – Mechanical Engineering)
RPI	23,922	• BS	• 112	• MS • PhD	MS 6 PHD 29	17		13
The University of Texas at Austin	51,331	• BS (ME)	• 1213	• MS • PhD	MS 17 PHD 18	6		15
Kansas State University	33,681	• BS (ME)	• 965	• MS • PhD	MS 6 PHD 11	5		16

APPENDIX E
Faculty Curriculum Vitae

1. NAME AND ACADEMIC RANK: **Neven Y. Ali Lecturer III**
2. DEGREES:
Ph.D. Nuclear Engineering, Missouri University of Science and Technology, 2016
M.S. Nuclear Engineering, Missouri University of Science and Technology, 2014
M.S. Computer Information System, Arab Academy for Banking and Financial Sciences University, Jordan 2008
B.Sc., B.S. Software Engineering, Al-Rafidain University, Iraq 2001
3. NUMBER OF YEARS SERVICE ON THIS FACULTY: 9 Months
2017 August -present • Lecturer III
4. OTHER RELATED EXPERIENCE – TEACHING, INDUSTRIAL, ETC.:
Oct 2001-Spt 2005, Lab instructor and Teacher, Dept. of Computer Science, Al-Mustansirya University, Iraq
Oct 2006-Feb 2008, Translator, *Al Dustoor newspaper*, Jordan
Mar 2008-Aug 2008, Instructor, Dept. of Computer Science Princes Sumaiya University, Jordan
June 1, 2016 – August 1, 2017, Postdoc, Dept of Nuclear Engineering Missouri University of Science and Technology
5. STATES IN WHICH PROFESSIONALLY LICENSED: NONE
6. SCIENTIFIC AND PROFESSIONAL SOCIETIES:
American Nuclear Society
7. HONORS AND AWARDS:
Fellow Missouri S&T – Chancellor's Fellowship (2011)
Fellow Missouri S&T – GAANN (2013)

8. INSTITUTIONAL AND PROFESSIONAL SERVICE IN LAST 5 YEARS:
2017 August -present • Lecturer III Department of Nuclear Engineering. UNM
June 1, 2016 – August 1, 2017, Postdoc, Dept of Nuclear Engineering Missouri University of Science and Technology
Mar 2008-Aug 2008, Instructor, Dept. of Computer Science Princes Sumaiya University, Jordan
Oct 2001-Spt 2005, Lab instructor and Teacher, Dept. of Computer Science, Al-Mustansirya University, Iraq

9. PRINCIPAL PUBLICATIONS OF LAST FIVE YEARS:
Ali, N., Al-Juwaya, T., Al-Dahhana, M., (2016), Demonstrating the non-similarity in local holdups of spouted beds obtained by CT with scale-up methodology based on dimensionless groups, Chemical Engineering Research and Design (2016), http://dx.doi.org/10.1016/j.cherd.2016.08.010

Ali, N., Al-Juwaya, T., Al-Dahhana, M., (2016), An advanced evaluation of spouted beds scale-up for coating TRISO nuclear fuel particles using radioactive particle tracking (RPT), Experimental Thermal and Fluid Science (2016), http://dx.doi.org/10.1016/j.expthermflusci.2016.08.002

Neven Ali, Thaar Al-Juwayaa, Muthanna Al-Dahhanab, (2016), An advanced evaluation the new mechanistic scale-up methodology of gas-solid spouted using radioactive particle tracking (RPT), "Accepted pending minor revisions" journal of Particuology.

Neven Ali, Thaar Al-Juwayaa, Muthanna Al-Dahhanab, (2016), Evaluating the new mechanistic scale-up methodology of gas-solid spouted beds using gamma ray computed tomography (CT), Submitted to journal of Powder Technology.

10. PROFESSIONAL DEVELOPMENT (LAST YEAR)

Neven Y. Ali – Dr. Neven Y. Ali invited to the workshop on Laboratories Safety and Security Sponsored by US Department of State and Organized by Sandia National Lab – Kansas City, December 1-3, 2017. Dr. Neven Y. Ali served in the Search committee for tenure track assistant professor hire in the department of nuclear engineering. Also, she was a Co-PI (Neven Ali) (with PI-Muthanna Al-Dahha, Missouri S&T, Rolla) in a proposal for the IAEA - Imaging Technologies for Process Investigations and Components Testing – Coordinated Research Project (CRP) – December, 2017. Title: Advancing the development of multiradiation imaging techniques and their imaging reconstruction algorithms and the radiotracing techniques and their algorithms of data analysis for improved monitoring of complex multiphase flow systems and the development of new systems for the recent raising needs for advanced sustainable construction materials

1. NAME AND ACADEMIC RANK: **Osman Anderoglu** **Assistant Professor**

2. DEGREES:

Ph.D., Materials Science and Eng, Texas A&M University, College Station, TX 2010

MSc., Mechanical Engineering, Texas A&M University, College Station, TX 2004

B.Sc., Mechanical Engineering, Bogazici University, Istanbul, Turkey, 2001

3. NUMBER OF YEARS SERVICE ON THIS FACULTY: 2 years

2016-present • Assistant Professor

4. OTHER RELATED EXPERIENCE – TEACHING, INDUSTRIAL, ETC.:

2016-present, *Affiliate*, Los Alamos National Laboratory

2016-present, *Affiliate*, Sandia National Laboratory

2013-2016 *Technical Staff Member*, Los Alamos National Laboratory

2010-2013 *Postdoctoral Research Associate*, Los Alamos National Laboratory

5. STATES IN WHICH PROFESSIONALLY LICENSED: NONE

6. SCIENTIFIC AND PROFESSIONAL SOCIETIES:

American Nuclear Society (2016-present)

The Metal, Minerals, and Materials Society (2005-present)

Materials Research Society (2016-17)

Toastmasters International (2013-16)

7. HONORS AND AWARDS:

DOE, Office of Nuclear Energy, Fuel Cycle R&D Excellence Award, 2012

ANS Literacy Award 2015

DOE NE Certificate of appreciation on Accident Tolerant Cladding work 2016

8. INSTITUTIONAL AND PROFESSIONAL SERVICE IN LAST 5 YEARS:

2018, TMS Symposium session chair, Materials and Fuels for Current and Adv Nucl Reactors

2016, TMS Symposium co-organizer, Phase Transformations and Microstructural Evolution

2016, TMS Symposium co-organizer, Nanostructured Materials for Nuclear Applications

2014, TMS Symposium co-organizer, session chair Phase Transform. Induced by Irradiation

9. PRINCIPAL PUBLICATIONS OF LAST FIVE YEARS:

E. Aydogan, S. A. Maloy, O. Anderoglu, et al. “Effect of tube processing methods on microstructure, mechanical properties and irradiation response of 14YWT nanostructured ferritic alloys” Acta Materialia 134, 116 (2017)

E Aydogan, N Almirall, GR Odette, SA Maloy, O Anderoglu, et al. “Stability of nanosized oxides in ferrite under extremely high dose self ion irradiations” Journal of Nuclear Materials 486, 86 (2017)

C Tomchik, J Almer, O Anderoglu, et al “High energy X-ray diffraction study of the relationship between the macroscopic mechanical properties and microstructure of irradiated HT-9 steel” Journal of Nuclear Materials 475, 46 (2017)

E Aydogan, S Pal, O Anderoglu, et al “Effect of tube processing methods on the texture and grain boundary characteristics of 14YWT nanostructured ferritic alloys” Materials Science and Engineering: A 661, 222 (2016)

SA Maloy, TA Saleh, O Anderoglu, et al. "Characterization and comparative analysis of the tensile properties of five tempered martensitic steels and an oxide dispersion strengthened ferritic alloy irradiated at≈ 295° C to≈ 6.5 dpa" Journal of Nuclear Materials 468, 232 (2016)
E Aydogan, O Anderoglu, et al. "Effect of shock loading on the microstructure, mechanical properties and grain boundary characteristics of HT-9 ferritic/martensitic steels" Materials Science and Engineering: A 651, 75-82 (2016)
C Sun, M Kirk, M Li, K Hattar, Y Wang, O Anderoglu, et al. "Microstructure, chemistry and mechanical properties of Ni-based superalloy Rene N4 under irradiation at room temperature" Acta Materialia 95, 357 (2015)
Y Xu, SK Yadav, JA Aguiar, O Anderoglu, et al. "Irradiation-induced formation of a spinel phase at the FeCr/MgO interface" Acta Materialia 93, 87 (2015)
C Sun, E Martínez, JA Aguiar, A Caro, JA Valdez, K Baldwin, Y Xu, BP Uberuaga, O. Anderoglu, S.A. Maloy "Thermally Induced Interdiffusion and Precipitation in a Ni/Ni3Al System" Materials Research Letters 3 (3), 169 (2015)
Y Xu, JA Aguiar, SK Yadav, O Anderoglu, et al. "Solute redistribution and phase stability at FeCr/TiO 2− x interfaces under ion irradiation" Acta Materialia 89, 364 (2015)
HT Bach, O Anderoglu, et al "Proton irradiation damage of an annealed Alloy 718 beam window" Journal of Nuclear Materials 459, 103 (2015)
JA Aguiar, O Anderoglu, et al "Nanoscale morphologies at alloyed and irradiated metal-oxide bilayers" Journal of materials science 50 (7), 2726 (2015)
CA Yablinsky, KE Tippey, S Vaynman, O Anderoglu, et al. "Concepts for the development of nanoscale stable precipitation-strengthened steels manufactured by conventional methods" JOM 66 (12), 2467 (2014)
GS Was, Z Jiao, E Getto, K Sun, AM Monterrosa, SA Maloy, O Anderoglu, et al. "Emulation of reactor irradiation damage using ion beams" Scripta Materialia 88, 33 (2014)
TS Byun, JH Baek, O Anderoglu, SA Maloy, MB Toloczko "Thermal annealing recovery of fracture toughness in HT9 steel after irradiation to high doses" Journal of Nuclear Materials 449 (1-3), 263 (2014)
MK Patel, DJ Tallman, JA Valdez, J Aguiar, O Anderoglu, et al. "Effect of helium irradiation on Ti3AlC2 at 500 C" Scripta Materialia 77, 1 (2014)
PL Mosbrucker, DW Brown, O Anderoglu, et al. "Neutron and X-ray diffraction analysis of the effect of irradiation dose and temperature on microstructure of irradiated HT-9 steel" Journal of nuclear materials 443 (1-3), 522 (2013)
J Van den Bosch, O Anderoglu, et al. "SANS and TEM of ferritic–martensitic steel T91 irradiated in FFTF up to 184 dpa at 413° C" Journal of Nuclear Materials 440 (1-3), 91 (2013)
O Anderoglu, MJ Zhou, J Zhang, YQ Wang, SA Maloy, et al. "He+ ion irradiation response of Fe–TiO2 multilayers" Journal of nuclear materials 435 (1-3), 96 (2013)
O Anderoglu, TS Byun, M Toloczko, SA Maloy "Mechanical performance of ferritic martensitic steels for high dose applications in advanced nuclear reactors" Metallurgical and Materials Transactions A 44 (1), 70-83

10. PROFESSIONAL DEVELOPMENT (LAST YEAR)

Dr. Anderoglu attended and chaired a session at 2018 TMS meeting (March 2018, Phoenix, AZ). He gave invited talks at the Idaho National Laboratory (August 2017). Dr Anderoglu also reviewed papers for Journal of Nuclear Materials, Materials Science and Engineering, and other journals. He also hosted DOE NE Fuel Cycle meeting at UNM in December 2017.
Dr Anderoglu has been serving as the ANS faculty advisor since 2017.

1. NAME AND ACADEMIC RANK: **Cassiano R. E. De Oliveira** **Professor**
2. DEGREES:
B.S., Physics, Catholic University of Rio de Janeiro, Brazil, 1976
M.S., Nuclear Engineering, Federal University of Rio de Janeiro, Brazil, 1980
Ph.D., Nuclear Engineering, University of London, UK, 1986
3. NUMBER OF YEARS SERVICE ON THIS FACULTY: 11 YEARS
2007-present • Professor
4. OTHER RELATED EXPERIENCE – TEACHING, INDUSTRIAL, ETC.:
Instructor, Nuclear Data Processing Classes at Idaho National Laboratory
5. STATES IN WHICH PROFESSIONALLY LICENSED: NONE
6. SCIENTIFIC AND PROFESSIONAL SOCIETIES:
American Nuclear Society
The Institute of Physics, UK
7. HONORS AND AWARDS:
Fellow of The Institute of Physics, UK
8. INSTITUTIONAL AND PROFESSIONAL SERVICE IN LAST 5 YEARS:
Institutional Service
Member, UNM Faculty Senate (2012-2015, 2017-present)
Institutional Departmental Service
Nuclear Engineering Graduate Advisor (2012-2014)
Institutional Committee Memberships
Faculty Senate Research Policy Committee (2012-2014)
Faculty Senate Professional and Graduate Studies Committee (2012-2017)
School of Engineering Promotion and Tenure Committee (2012-2014)
Professional Society Membership
Member, ANS Undergraduate Scholarship Committee (2003-present)
Member, Executive Committee of the Mathematics and Computation Division of the American Nuclear Society (2014-2015)
Member, Working Party Nuclear Criticality Accidents, NEA/OECD, Paris. (2005- 2007)
Professional Society Conference organization
Chair and organizer, ANS Mathematics and Computation Topical Meeting, May 8-12 2011, Rio de Janeiro, Brazil.
Journal editing and reviewing
Member, Editorial Board of Annals of Nuclear Energy, Journal of Geophysics and Engineering and Journal of Nuclear Desalination
Reviewer for *Annals of Nuclear Energy, Nuclear Science and Engineering, Nuclear Technology, Transport Theory and Statistical Physics, International Journal of Numerical Methods in Fluids, International Journal of Heat Transfer, Journal of Nuclear Science and Technology, Journal of Hybrid Methods, Vacuum, Journal of Computational Physics, Medical Physics, Applied Optics, Optics Express*9. PRINCIPAL PUBLICATIONS OF LAST FIVE YEARS:
N. Fathi, P. McDaniel, S.S. Aleyasin, M. Robinson, P. Vorobieff, S. Rodriguez, C.R.E. de Oliveira," Novel Integrated Solar-Nuclear Combined Cycle Power Plant", Journal of Cleaner Production 180 (2018) 407

N. Fathi, P. McDaniel, C. Forsberg, C.R.E. de Oliveira, “ Power Cycle Assessment of Nuclear Systems, Providing Energy Storage for Low Carbon Grids”, ASME Journal of Nuclear Engineering and Radiation Science 4 (2018) 020911

J.K. Patel, H. Park, C.R.E. de Oliveira and D.A. Knoll, “Efficient Multiphysics Coupling for Fast Burst Reactors in Slab Geometry”, *Journal of Computational and Theoretical Transport*, 43 (2014) 1

W.J. Martin, C.R.E. de Oliveira and A.A. Hecht, “Dual Neutral Particle Induced Transmutation in CINDER2008”, *Nucl. Instr. Meth. A* 767 (2014) 163

W.J. Martin, C.R.E. de Oliveira, A. A. Hecht, “Reactor Fuel Depletion Benchmark of TINDER”, *Annals of Nuclear Energy*, 73 (2014) 547

Zohuri, P.J. McDaniel and C.R.E. de Oliveira, “Advanced Nuclear Open Air-Brayton Cycles for Highly Efficient Power Conversion”, *Nuclear Technology* 192 (2015) 48

10. PROFESSIONAL DEVELOPMENT ACTIVITIES IN LAST FIVE YEARS:

Attended and presented papers at ANS National Meetings and also ANS Mathematics and Computation and Rector Physics Divisions Topical Meetings

1. NAME AND ACADEMIC RANK: **Mohamed S. El-Genk, Distinguished and Regents' Professor**, Nuclear, Mechanical, Chemical & Biological Engineering; and Founding Director, Institute for Space Nuclear Power Studies, University of New Mexico

2. DEGREES:

PhD, Nuclear Engineering, University of New Mexico (1976-78)
MS, Nuclear Engineering, University of Alexandria, Egypt (1973-75)
BS, Nuclear Engineering, University of Alexandria, Egypt (1963-68)

3. NUMBER OF YEARS OF SERVICE ON THIS FACULTY: 37 YEARS

2018-Present • Distinguished and Regents' Professor
1996-2018 • Regents' Professor
1988-1996 • Professor
1984-1988 • Associate Professor
1981-1984 • Assistant Professor

4. OTHER RELATED EXPERIENCE – TEACHING, INDUSTRIAL, ETC.:

Founding Director, UNM Institute for Space and Nuclear Power Studies (1984-present)

Engineering Specialist (1980-81), Associate Engineering Specialist (1978-80), Light Water Reactor (LWR) Fuel Behavior Research Division, EG&G Idaho, Inc., Idaho Falls, ID

Research Engineer (1974-75), Egyptian Atomic Energy Commission

Power Engineer (1968-74), Egyptian General Organization of Industrialization

5. STATES IN WHICH PROFESSIONALLY LICENSED: None

6. SCIENTIFIC AND PROFESSIONAL SOCIETIES:

American Nuclear Society (ANS), Fellow
American Institute of Chemical Engineers (AIChE), Fellow
American Institute of Aeronautics and Astronautics (AIAA), Associate Fellow
American Society of Mechanical Engineers (ASME), Fellow
American Society of Engineering Education (ASEE), Senior Member
International Association for the Advancement of Space Safety (IAASS), Fellow

7. HONORS AND AWARDS: (IN LAST 5 YEARS)

Recipient, 2017 ASME Heat Transfer Memorial Award
Recipient, 2015 ANS Thermal-Hydraulics Technical Achievement Award
2015 Visiting Scholar, European Space Agency-European Space Research and Technology Center, Noordwijk, Netherlands
2011 Recipient UNM 46th Annual Research Lecturer Award,
Patents in last 5 years
US 20160329113A1, ***SLIMM-Scalable Liquid Metal Cooled Small Modular Reactor***, EL-Genk, M. S, UNM-STC Ref No. 2014-053-03, 10 November 2016

8. INSTITUTIONAL AND PROFESSIONAL SERVICE IN THE LAST FIVE YEARS:

Member, Faculty Senate Academic Freedom and Tenure Committee, UNM, 2010 – 2015
Provost's Promotion and Tenure Committee, 2012 – 2015
SOE Research Council, 2011 – 2013, SOE Promotion and Tenure Committee, 2014-present; Academic Council, 2015-present, and Annual Senior Design Expo, 2014-present, NE graduate Committee, 2016-present, UNM Faculty Senate, 2018-present

Associate Editor, ASME J. Thermal sciences and Engineering Applications, 2014 – present, Editor, Int. Journal Process Systems Engineering (IJPSE).

Member, Scientific Council, Int. Center for Heat and Mass Transfer, 2005-present; Editorial Board, ISRN Chemical Engineering, 2011-present; Editorial Board, J. Nuclear Energy Science and Power Generation Technology (JNPGT), 2012-present; Member, International Advisory Committee, IV Energy and Materials Research Conference-EMR2018, Torremolinos-Malaga, Spain; Co-Chair, Regional Scientific Committee, USA, Mexico and Central America, 16th Inter. Heat Transfer Conference, Beijing, China, 2017-2018; Regional Editor, Track Leader, Inter. Conf. on Nuclear Engineering (ICONE-24), London, England, 2018; Member, Technical Committee on Intelligent Green Production Systems (IGPS), IEEE-Systems, Man, and Cybernetics Society, 2017-present; Member, Editorial Board, Journal of Nuclear Energy Science and Power Generation Technology (JNPGT), 2012-present; Editor, Member, Scientific Committee, Assembly of World Conferences on Experimental Heat Transfer, Fluid Mechanics & Thermodynamics (ExHFT), 2011-present, Member, AIAA Aerospace Technical Program Committee and AIAA Nuclear and Future Flight Propulsion Technical Program Committee.

9. PRINCIPAL PUBLICATIONS OF LAST FIVE YEARS (PARTIAL LIST):

El-Genk MS, et al., "Chemical Kinetics Parameters and Model Validation for the Gasification of PCEA Nuclear Graphite," ***J. Nucl. Materials***, 444 2014, 112 - 128. 2

El-Genk MS, A Suszko, "Saturation Nucleate Boiling and Correlations for PF-5060 Dielectric Liquid on Inclined Rough Copper Surfaces," ***J. Heat Transfer***, 136, 2014, 081503-1 - 081503-10.

Schriener TM, MS El-Genk, "Comparative CFD Analyses of Liquid Metal Cooled Reactor for Lunar Surface Power," ***J. Nucl. Eng.. & Design***, 280, 2014, 105-121.

Cowen BJ, MS El-Genk, "On Force Fields for Molecular Dynamics Simulation of Crystalline Silica," ***J. Computational Materials Science***, 107, 2015, 88-101.

El-Genk MS, A Suszko, "Effects of Inclination Angle and Liquid Subcooling on Nucleate Boiling on Dimpled Copper Surfaces," ***Int. J. Heat & Mass Transfer***, 95, 2016.

Haskins, DA, MS El-Genk, "CFD Analyses and Correlation of Pressure Losses on the Shell-Side of Concentric, Helically-Coiled Tubes Heat Exchanger," ***J. Nuclear. Enneerin. & Design***, 305 (2016) 531-546.

El-Genk, MS, J-M Tournier, "Reliable and Safe Thermal Coupling of Generation-IV VHTR to a Hydrogen Fuel Production Complex," ***J. Thermal Science and Engineering Progress***, 3, 2017, 164-170.

Cowen, BJ, MS El-Genk, "Estimates of Point Defect Production in α-Quartz using Molecular Dynamics Simulations," ***J. Modeling and Simulation in Materials Science and Engineering***, 25, 2017.

El-Genk, MS, et al., "Low-Enrichment and Long-Life **S**calable **LI**quid **M**etal Cooled Small **M**odular Reactor (SLIMM-1.2)," ***J. Nucl. Eng. & Design***, 316, 2017, 163-185.

El-Genk, MS, TM Schriener, "Post-Operation Radiological Source Term and Dose Estimates for the **S**calable **LI**quid **M**etal-cooled small **M**odular Reactor," ***Annals of Nuclear Energy***, 115, 2018, 442-458.

10. PROFESSIONAL DEVELOPMENT ACTIVITIES DURING LAST FIVE YEARS:

Attended and presented papers at several ANS annual meetings and topical conferences on nuclear reactors technology and thermal hydraulics, and on small modular reactors. He developed and taught a new course on nuclear fuel and materials and has taught 3- 4 courses per year, all to seniors and graduate students.

1. NAME AND ACADEMIC RANK: **Adam A. Hecht** **Associate Professor**

2. DEGREES:

Ph.D., Physics, Yale University, 2004

M.Ph., Physics, Yale University, 2001

M.S., Physics, Yale University, 1998

B.S., Physics, University of California, Irvine, 1997

3. NUMBER OF YEARS SERVICE ON THIS FACULTY: 10 years

2017-present • Associate Chair, Department of Nuclear Engineering

2016-present • Associate Professor

2008-2016 • Assistant Professor

4. OTHER RELATED EXPERIENCE – TEACHING, INDUSTRIAL, ETC.:

Post-Doctoral Researcher, U. Wisconsin Dept. of Medical Physics 2007-2008

Post-Doctoral Researcher through U. Md. based at Physics Division, Argonne National Laboratory, 2004-2007

Adjunct Faculty, Department of Physics, University of Illinois, Chicago, 2006

Adjunct Faculty, Department of Physics, DePaul University, Chicago, IL, 2005

5. STATES IN WHICH PROFESSIONALLY LICENSED:

6. SCIENTIFIC AND PROFESSIONAL SOCIETIES:

American Nuclear Society

Institute of Nuclear Materials Management

7. HONORS AND AWARDS:

Junior Faculty Teaching Excellence Award 2014

8. INSTITUTIONAL AND PROFESSIONAL SERVICE IN LAST 5 YEARS:

Associate Chair, Department of Nuclear Engineering, UNM

President of Southwest US Chapter of Institute of Nuclear Materials Management

Member at Large Southwest US Chapter of Institute of Nuclear Materials Management

Member at Large Trinity Section of American Nuclear Society

Founder/Advisor, Institute of Nuclear Materials Management UNM student chapter

Journal Referee for: Physical Review C, Nuclear Instruments and Methods A, IEEE Transactions on Nuclear Science, Radiation Physics and Chemistry, Progress in Nuclear Energy

Grant Referee for: DOE-Nuclear Engineering University Programs (NEUP), DOE-SBIR/STTR, DTRA Basic Research for Combating WMD

9. PRINCIPAL PUBLICATIONS OF LAST FIVE YEARS:

Cosmic ray muon computed tomography of spent nuclear fuel in dry storage casks

D. Poulson, J.M. Durham, E. Guardincerri, C.L. Morris, J.D. Bacon, K. Plaud-Ramos, D. Morley, A. Hecht, Nuclear Instruments and Methods A 842, 48-53 (2017)

Study of worker's exposure to Tantalum-bearing particles in a mining and metallurgical plant, K. Moore Dias da Cunha, K.C. Dalia Pereira, J.R.D. Guimarães, C. Lima, J.E. C. Nascimento, R. Lima, A.A. Hecht, J.C.B. Fiel, Environmental Geochemistry and Health (2016)

High-resistivity semi-insulating AlSb on GaAs substrates grown by molecular beam epitaxy, E.I. Vaughan, S. Addamane, D.M. Shima, G. Balakrishnan, A.A. Hecht

Journal of Electronic Materials 45, 2025-2030 (2016);

A compact cryogenic pump, Gang Li, Shane Caldwell, Jason A. Clark, Sidney Gulick, Adam Hecht, Daniel D. Lascar, Tony Levand, Graeme Morgan, Rodney Orford, Guy Savard, Kumar S. Sharma, Jonathon Van Schelt, Cryogenics 75, 35-37 (2016)
The SPIDER fission fragment spectrometer for fission product yield measurements, K. Meierbachtol, F. Tovesson, D. Shields, C. Arnold, R. Blakeley, T. Bredeweg, M. Devlin, A.A. Hecht, L.E. Heffern, J. Jorgenson, A. Laptev, D. Mader, J.M. O'Donnell, A. Sierk, M. White, Nuclear Instruments and Methods A 788, 58 (2015)
Thin Film Gallium Antimonide for Room Temperature Radiation Detection
E.I. Vaughan, N. Rahimi, G. Balakrishnan, A.A. Hecht, Journal of Electronic Materials 44, 3288-3293 (2015)
Detecting Special Nuclear Material Using Muon-Induced Neutron Emission
Elena Guardincerri, Jeffrey Bacon, Konstantin Borozdin, J. Matthew Durham, Joseph Fabritius II, Adam Hecht, Edward C. Milner, Haruo Miyadera, C.L. Morris, John Perry, Daniel Poulson, Nuclear Instruments and Methods A 789, 109 (2015)
Radiolytic yield of ozone in air for low dose neutron and x-ray/gamma-ray radiation
J. Cole, S. Su, R.E. Blakeley, P. Koonath, A.A. Hecht, Radiation Physics and Chemistry 106, 95 (2015)
Novel techniques for high precision refractive index measurements, and application to assessing neutron damage and dose in crystals, K. Masuda, E.I. Vaughan, L. Arissian, J.P. Hendrie, J. Cole, J.-C. Diels, A.A. Hecht, Nuclear Instruments and Methods A 784, 198 (2015)
Dual neutral particle induced transmutation in CINDER2008, W.J. Martin, C.R.E. de Oliveira, A.A. Hecht, Nuclear Instruments and Methods A 767, 163 (2014)
Development of position-sensitive time-of-flight spectrometer for fission fragment research, C.W. Arnold, F. Tovesson, K. Meierbachtol, T. Bredeweg, M. Jandel, H.J. Jorgenson, A. Laptev, G. Rusev, D.W. Shields, M. White, R.E. Blakeley, D.M. Mader, A.A. Hecht, Nuclear Instruments and Methods A 764, 53 (2014)
Reactor fuel depletion benchmark of TINDER, W.J. Martin, C.R.E. de Oliveira, A.A. Hecht, Annals of Nuclear Energy 73, 547 (2014)
Comparison of Geant4 and MCNP6/CINDER for use in Delayed Fission Radiation Simulation, A.A. Hecht, R.E. Blakeley, W.J. Martin, E. Leonard, Annals of Nuclear Energy 69, 134 (2014)
Imaging a nuclear reactor using cosmic ray muons, John Perry, et al., J. Appl. Phys. 113, 184909 (2013)
Ground water contamination with ^{238}U, ^{234}U, ^{235}U, ^{226}Ra and ^{210}Pb from past uranium mining: Cove Wash, Arizona, Kenya Moore Dias da Cunha, Helenes Henderson, Bruce M. Thomson, Adam A. Hecht, Environmental Geochemistry and Health (2013)
Medium- and high-spin band structure of the chiral candidate ^{132}La, I. Kuti *et al.*, Physical Review C 87, 044323 (2013)
Radon in indoor concentrations and indoor concentrations of metal dust particles in museums and other public buildings, G.L. Carneiro, D. Braz, E.F. de Jesus, S. M. Santos, K. Cardoso, A. A. Hecht, K. Moore Dias da Cunha, Environ Geochem Health, 35:333-340, (2013)

10. PROFESSIONAL DEVELOPMENT (LAST YEAR):

Adam Hecht is an active professor in both teaching and research, and attends several research conferences per year, and sends students to research conferences as well.

1. NAME AND ACADEMIC RANK: **Youho Lee** **Assistant Professor**

2. DEGREES:

Ph.D., Nuclear Engineering, Massachusetts Institute of Technology, 2013

M.S., Nuclear Engineering, Massachusetts Institute of Technology, 2011

B.S., Nuclear and Quantum Engineering, Korea Advanced Institute of Science and Technology (KAIST), 2009

3. NUMBER OF YEARS SERVICE ON THIS FACULTY: 2 years

2016-present • Assistant Professor

4. OTHER RELATED EXPERIENCE – TEACHING, INDUSTRIAL, ETC.:

Post-doctoral research fellow, Korea Advanced Institute of Science and Technology (KAIST), 2013 - 2016

5. STATES IN WHICH PROFESSIONALLY LICENSED:

None

6. SCIENTIFIC AND PROFESSIONAL SOCIETIES:

American Nuclear Society

7. HONORS AND AWARDS:

Best Paper Award, Division of Fuel and Materials, Korean Nuclear Society, 2014

Paper title: Structural Analysis of Surface-Modified Oxidation-Resistant Zirconium Alloy Cladding for Light Water Reactors

8. INSTITUTIONAL AND PROFESSIONAL SERVICE IN LAST 5 YEARS:

Lead PI of three DOE-NEUP Projects on (1) flow-accelerated corrosion in advanced reactors (FY17), (2) Accident Tolerant Fuel (ATF) critical heat flux (FY17), and (3) Radioisotope retention in flowing lead (FY18)

Co-PI of a DOE-IRP project to support the MBM code validation for TREAT restart (FY16) and a DOE-NEUP project on LWR safety analysis with ATF cladding (FY18)

Total research expenditure (2016.9 – present): $3.31 million (PI+Co-PIs)

Committee member, Reputation and Ranking Committee, School of Engineering, University of New Mexico, 2017-present

9. PRINCIPAL PUBLICATIONS OF LAST FIVE YEARS:

2018. Maolong Liu, **Youho Lee***, Dasari V. Rao. Development of Effective Thermal Conductivity Model for Particle-Type Nuclear Fuels Randomly Distributed in a Matrix. Journal of Nuclear Materials, (508), 168-180

2017. **Youho Lee**, Hee Cheon NO, Jeong Ik Lee. Design Optimization of Multi-Layer Silicon Carbide Cladding for Light Water Reactors. Nuclear Engineering and Design,

2016. **Youho Lee**, Bokyung Kim, Hee Cheon NO. Improving Safety Margin of LWRs by Rethinking the Emergency Core Cooling System Criteria and Safety System Capacity. Nuclear Engineering and Design, 307, 402-410311, 213-223

2016. **Youho Lee**, Jeong Ik Lee, Hee Cheon NO. Impacts of Transient Heat Transfer Modelling on Prediction of Advanced Cladding Fracture during LWR LBLOCA. *Nuclear Engineering and Design*, 298, 25-32.

2016. **Youho Lee**, Thomas J. McKrell, Mujid S. Kazimi. Oxidation Behavior of Sintered Tubular Silicon Carbide in Pure Steam II: Weight-Loss Correlation Developments. *Ceramics International, 42, 4679-4689.*

2016. **Youho Lee**, Thomas J. McKrell, Aline Montecot, Michael Pantano, Yann Song, Mujid S. Kazimi. Oxidation Behavior of Sintered Tubular Silicon Carbide in Pure Steam I: Experiments. *Ceramics International, 42, issue 1, Part B, 1916-1925.*
2015. **Youho Lee**, Thomas J. McKrell, Mujid S. Kazimi. Thermal Shock Fracture of Hot Silicon Carbide Immersed in Water. Journal of Nuclear Materials, 467, 172-180.
2015. **Youho Lee**, Ho Sik Kim, Hee Cheon NO. Failure probabilities of SiC Clad Fuel during a LOCA in Public Acceptable Simple SMR (PASS). Nuclear Engineering and Design, 292, 1-16.
2015. **Youho Lee**, Mujid S. Kazimi. A Structural Model for Multi-Layered Ceramic Cylinders and its Application to Silicon Carbide Cladding of Light Water Reactor Fuel. *Journal of Nuclear Materials, 458, 87-105.*
2014. **Youho Lee**, Jeong Ik Lee. Structural Assessment of Intermediate Printed Circuit Heat Exchanger for Sodium-Cooled Fast Reactor with Supercritical CO_2 Cycle. Annals of Nuclear Energy, 73, 84-95.

10. PROFESSIONAL DEVELOPMENT (LAST YEAR):

None

1. NAME AND ACADEMIC RANK: **Anil K. Prinja** **Distinguished Professor and Chair**

2. DEGREES:

Ph.D., Nuclear Engineering, University of London, UK, 1980

B.Sc., Nuclear Engineering, University of London, UK, 1976

3. NUMBER OF YEARS SERVICE ON THIS FACULTY: 31 years

2015-present • Chair, Department of Nuclear Engineering

2014-2015 • Acting Chair, Department of Nuclear Engineering

2002-2012 • Associate Chair (Department of Chemical and Nuclear Engineering)

2016 – present • Distinguished Professor

1995-present • Professor

1989-1995 • Associate Professor

1987-1989 • Assistant Professor

4. OTHER RELATED EXPERIENCE – TEACHING, INDUSTRIAL, ETC.:

July 1999 – Present, *Secondary Appointment*: Professor, Dept. of Mathematics and Statistics, UNM

2006 - 2012, Co-Director, *Center for Nuclear Nonproliferation Science and Technology*

April 2012, Visiting Professor (*Sabbatical*), Mechanical Engineering Department, Nuclear Engineering Program, Imperial College, London, UK

Feb 2012, Visiting Professor (*Sabbatical*), Dipartimento Energia, Politecnico di Torino, Italy

1995 – Present, *Affiliate*, Los Alamos National Laboratory

5. STATES IN WHICH PROFESSIONALLY LICENSED: NONE

6. SCIENTIFIC AND PROFESSIONAL SOCIETIES:

American Nuclear Society

7. HONORS AND AWARDS:

American Nuclear Society *Gerald C. Pomraning* Award (2015)

NNSA Defense Programs *Award of Excellence* (2009)

UNM School of Engineering *Senior Faculty Teaching Excellence* Award (2003)

Fellow, American Nuclear Society (2003)

8. INSTITUTIONAL AND PROFESSIONAL SERVICE IN LAST 5 YEARS:

July 2015 – present, Chair of Department of Nuclear Engineering

July 2015 – present, Faculty Search Hiring Officer

July 2014 – July 2015, Acting Chair of Department of Nuclear Engineering

July 2014 – present, School of Engineering *Leadership Council*

August 2015 – July 2017, University *Promotion and Tenure Committee*

June 2013 - May 2014, Chair, *Nuclear Engineering Departments Heads Organization* (NEDHO)

June 2012 - May 2013, Vice Chair, *Nuclear Engineering Departments Heads Organization* (NEDHO)

July 2011 – June 2012, *Chair*, Mathematics and Computations Division, American Nuclear Society.

June 8 - 10, 2010, Member, DOE *LANL Computational Physics and Applied Mathematics Capability Review* Committee

Member of the Editorial Board, *Annals of Nuclear Energy*

Member of the Editorial Board, *Journal of Computational and Theoretical Transport*

9. PRINCIPAL PUBLICATIONS OF LAST FIVE YEARS:
Gonzales, M.A., Kiedrowski, B.C., Prinja, A.K., and Brown, F.B., "Analytical, Semi-Analytical, and Numerical Heavy--Gas Verification Benchmarks of the Effective Multiplication Factor and Temperature Coefficient," *Nuclear Science and Engineering*, **191**, 1 (2018).
Saxby J.E.M., Prinja, A.K., and Eaton, M.D., "Energy Dependent Transport Model of the Neutron Number Probability Distribution in a Subcritical Multiplying Assembly", *Nuclear Science and Engineering*, **189**, 1 (2018).
Morel, J.E., Warsa, J.S., Franke, B.C., and Prinja, A.K., "Comparison of Two Galerkin Quadrature Methods," *Nuclear Science and Engineering*, **185**, 325 (2017).
Cooling, C.M., Ayres, D.A.F., Prinja, A.K., and Eaton, M.D. "Uncertainty and Global Sensitivity Analysis of Neutron Survival and Extinction Probabilities Using Polynomial Chaos," *Annals of Nuclear Energy*, **88**, 158 (2016)
Prinja, A.K., "Effect of Spatio-Temporal Noise in the Eddington Factor on the Scalar Flux", *Annals of Nuclear Energy*, **86**, 116 (2015).
Dixon, D., Prinja, A.K. and Franke, B.C., "A Computationally Efficient Moment-Preserving Monte Carlo Electron Transport Method With Implementation in Geant4," *Nuclear Instruments and Methods*, **B 359**, 20 (2015).
Prinja, A.K., "Lewis Theory for Energy Straggling in Thin Layers," *Nuclear Instruments and Methods*, **B 330**, 99 (2014).
Dulla, S., Prinja, A.K., and Ravetto, P. "Random Effects on Reactivity in Molten Salt Reactors," *Annals of Nuclear Energy*, **64**, 353 (2014).
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10. PROFESSIONAL DEVELOPMENT (LAST YEAR)
Anil K. Prinja – Dr. Prinja attended and chaired a session at 2017 Winter ANS meeting and served as Co-organizer of the 25th International Conference on Transport Theory (October 2017, Monterey, CA). During 2016-17 Dr. Prinja represented the National University Consortium on the Board Of Managers of the Battelle Energy Alliance and chaired the Board's Science and Technology Committee. He also served as a reviewer for the DOE-NEUP program and the NRC Faculty Development Program, reviewed papers for Nuclear Science and Engineering, Annals of Nuclear Energy, Journal of Computational Physics and other journals. Dr. Prinja also represented the department at the NEDHO meetings co-located with the two ANS meetings.