SCHOOL OF NUCLEAR ENGINEERING

GRADUATE MANUAL

JANUARY 2025 EDITION

School of Nuclear Engineering

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1.0 INTRODUCTION

The School of Nuclear Engineering extends a hearty welcome to all new graduate students. The purpose of this manual is to acquaint students with our procedures and regulations and provide information likely to be useful during their graduate careers. In particular, this manual contains supplementary regulations and procedures that are specific to the School of Nuclear Engineering (hereafter referred to as the "School"). It is not intended to replace information, regulations, or procedures contained in the Graduate School's "Policies and Procedures Manual for Administering Graduate Student Programs" or other University or Graduate School publications. In the event of conflict, the Graduate School and/or University regulations shall prevail over School policies.

This manual supersedes the previous versions. It is designed so that individual sections can be revised as needed. Students will receive a copy of the current version of the manual at the time when they officially enter the graduate program. Students should carefully read each section and review the manual as necessary. The Graduate Office will maintain a master copy and a copy of all revisions. Students may choose to follow the manual version in effect when they enter the graduate program or the version in effect during the academic year in which they graduate. Any requests for exceptions must be endorsed by the student's faculty advisor via a written petition and approved by the Graduate Committee and the Head of the School.

1.1 Organization of This Manual

Section 2.0 of this manual provides information on getting started in Purdue’s Nuclear Engineering Graduate Program, such as details on how to get a desk and access to the computer networks. Section 3.0 outlines expectations of those holding appointments as graduate assistants. Information on registration for courses for the first semester and beyond can be found in Section 4.0. Students pursuing a Master of Science in Nuclear Engineering (MSNE) and seeking a complete online non-residential Master of Nuclear Engineering (MNE) degree will find information about their program in section 5.2 and 5.3 respectively, while information on the Ph.D. program is in section 6.0.

2.0 GETTING STARTED

Upon arrival, an on-campus student will be provided with a desk based on their faculty advisor. Depending on the location of the office, keys for entering the building and the student's office are available upon request. Students assigned to Lambertus (LMBS) Hall shall check with the Nuclear Engineering office in LMBS 5281 to ensure they are added to the building and suite access lists. Other building and laboratory keys will be issued, if needed, upon request from the faculty member responsible for the particular building office space and laboratory.

It is recommended that the student quickly become familiar with the libraries and computer resources. The Library of Engineering and Science is in the Wilmeth Active Learning Center (WALC). The Physics and Mathematics Libraries are also rich sources of relevant material. Further information on Purdue Library system may be obtained from this website: https://www.lib.purdue.edu .

Registered students are provided with a computer account for Engineering Computer Network (ECN). Policies on access and usage may be obtained from the ECN website: https://engineering.purdue.edu/ECN. Each student will have access to a computer in the Student Lounge located in Potter Engineering Center.

Off-campus online students will receive an email account and access to Purdue facilities.

3.0 OBTAINING AND KEEPING YOUR GRADUATE ASSISTANTSHIP OR FELLOWSHIP

The School must make efficient use of its limited funding for graduate assistantships to assist faculty in teaching and research, as appropriate. These appointments are only offered to on-campus students and are continued on a competitive basis. The renewal of graduate assistantships requires satisfactory performance in teaching or research and suitable academic progress. Each student's academic performance is reviewed at the completion of each semester by the Graduate Chairperson. Any potential problem situations are brought to the attention of the Graduate Committee for appropriate action. The student's performance is judged on the following basis:

a. Overall academic performance at Purdue, particularly maintaining A or B grades in all Nuclear Engineering courses and at least a B average (3.0 GPA) in all coursework.
b. For teaching assistants (TAs), the review provided at the end of each semester by the instructor to whom the TA was assigned. Comments from students attending the class may also be considered in this evaluation. These reviews are retained in each TA’s

permanent file.

c. The grade (Satisfactory ‘S’ or Unsatisfactory ‘U’) assigned for research by the advisor.
d. For research assistants (RAs), including those whose academic advisor is different than the director of the project to which the RA has been assigned, the reviews provided at the end of each semester by the project director and the grade assigned for research by the academic advisor are considered. First semester graduate students may also receive a mid-semester performance review. These reviews are retained in the research assistant's permanent file.

Unsatisfactory performance in any of the above areas may result in reduction, termination, or non-renewal of the graduate appointment. Every effort will be made to maintain support for students in good standing (provided that such support is available). However, students whose continued support is in question for reasons of performance, based on reviews by the advisor, will be notified in writing of the reduction, termination, or non-renewal of the appointment. In the case of a lack of funding, every effort will be made to notify the student as soon as possible of a pending change in the support level.

Terms of a graduate fellowship or assistantship are specified in the offer letter. Students holding a graduate assistantship or fellowship appointment may obtain additional information about their employment and payment schedule from the Nuclear Engineering Business Office. If the student has any questions regarding employment conditions, the student should see his or her advisor immediately or, if one has not yet been selected, the Graduate Chairperson.

Teaching assistants will receive a course assignment notice during the week before classes begin. All teaching assistants should make sure they understand the nature of their assignment and meet with their assigned instructor/professor before classes begin. Each teaching assistant should complete and satisfy the university required certification and training required for teaching assistant position.

It is essential for students to understand that their performance as a researcher or teaching assistant is important both personally and to the entire School. Faculty members write research proposals to industry or a government agency specifying what research they will conduct and what products they will deliver in a given time period. The budget for the project as applicable includes funds to pay graduate students to do part of the work. If the work is not done properly or not completed on time, the project could be canceled, and it could be difficult for the faculty member to win additional research projects. Thus, a graduate student’s failure to perform satisfactorily on a research project can jeopardize funding for that student and, perhaps, several

others. On the other hand, exceptional performance can lead to recognition for the student and enhanced funding opportunities for the School.

Students holding teaching assistantships can improve their understanding of the material and develop valuable career skills. They have the responsibility to help students to master the course material.

Teaching or research assistants with a 50% appointment are expected to give their full attention to assigned duties for an average of 20 hours per week. Teaching or research assistants with a 25% appointment are expected to give their full attention to assigned duties for an average of 10 hours per week.

Please refer to the Graduate Student Employment Manual on the web for further information: https://www.purdue.edu/gradschool/documents/gpo/graduate-student-employment-manual.pdf

4.0 REGISTRATION

4.1 General Procedures

The incoming on-campus graduate student should identify a specific area of interest and find an advisor who is willing to guide his or her study in that area as soon as they join the school. For incoming off-campus online students, the Graduate Chairperson serves as advisor. The student and advisor work together to develop a Plan of Study (POS) that lists the courses the student will take to complete her or his degree. Each semester, the student will register for the courses slated for that semester on the POS. The POS can be modified at any time the student, advisor, and advisory committee agree to do so. For on campus-students who do not have an advisor in time to select courses for the first semester, the Graduate Chairperson will serve as a temporary advisor.

When preparing to register, the student will work with her or his advisor to ensure that:

a. courses are consistent with study objectives and area of specialization;
b. courses are consistent with graduation requirements;
c. the student has sufficient background for more advanced courses. Students coming from other universities and/or other scientific and engineering disciplines may be required to take equivalent graduate courses (e.g., NUCL 501 and NUCL 504) and in some cases undergraduate courses (e.g., NUCL 300, 310, 320, 402, and 410) to obtain the required background;

d. courses do not duplicate material the student has already studied;

e. the majority of courses in the POS should be Primary (P) where Primary courses are courses directly related to the student's research specialty as determined in consultation with the Graduate advisor. ALL core classes taken at Purdue (NUCL 501, 504, 510, 520, and 551) should be listed as Primary.

f. the student registers for the graduate seminar (NUCL 696) each semester.

In case of doubt in choosing between two courses, the student may register for both with the plan to drop one after a few days of classes when a more informed selection can be made. However, the student should be aware of time restrictions for adding or dropping courses. Please note that a late fee will be assessed if the student is not registered before the first day of classes.

To register, the student should confer with his or her advisor and register online through MyPurdue at https://mypurdue.purdue.edu/. When making course selections, be certain that there are no time conflicts. Courses must also meet any visa requirements for international students or requirements from supporting organizations that may apply.

The current schedule of classes can be found online via the student's MyPurdue account. Students can find textbooks for courses at the bookstores or online stores. Students wanting more information about a course are encouraged to discuss the course with the course instructor.

A normal *full-time on campus* graduate coursework/research load is 9-18 credits hours per semester and may not exceed 18 (3-9 credit hours not exceeding 9 during the summer sessions). A minimum of 8 credit hours must be taken for Fall and Spring semesters and 6 credit hours for summer session to be considered full-time.

Continuing graduate students should use online registration, which is available after Spring Break for summer session and fall semester, and after October break for the following spring semester.

During the graduate programs, various forms should be submitted before deadlines, such filing the plan of study (POS) for MS, MNE or Ph.D. programs, appointing the examination committee, setting up the Ph.D. preliminary examination, and scheduling the final (MS or Ph.D.) thesis defense through MyPurdue at https://mypurdue.purdue.edu/. It is the student's responsibility to submit all forms before relevant deadlines as late fees are applied for late submission of these requests. The Graduate School (West Lafayette campus) requires late fees for the following graduation-related situations:

1. Electronic Plan of Study received at the Graduate School in the session that the graduate student intends to receive his/her degree. Policies and Procedures for Administering

Graduate Student Programs requires that it be received at the Graduate School prior to the start of a session in which a student graduates. It is recommended that the Plan of Study be submitted by the end of the first session for master's students and the end of the third session for doctoral students.

2. Declaration of candidacy beyond the deadline. See https://www.purdue.edu/gradschool/about/calendar/index.html for deadline dates.

3. Listing on the Graduate School's candidate roster for the same degree more than two consecutive sessions. Students are considered to have been "Listed" on the candidate roster for a given term if a candidate registration (CAND 99100, 99200, or 99300) was entered for them at any point for that term.

4. Late deposit (after the final deposit deadline near the conclusion of each session) of a thesis or dissertation.

5. Making at least one update or correction to an already deposited thesis or dissertation.

Graduate students should periodically check the deadlines for various registration and submission of graduation related request. Graduation deadlines are available on the Graduate School web page (http://www.purdue.edu/gradschool/about/calendar/) via the *Deadlines Calendar* link.

4.2 Registration for Research

Students must be registered for thesis research (Master's - NUCL 698 or Ph.D. - NUCL 699) when they are conducting research requiring faculty direction and/or using University facilities. Students pursuing a non-thesis project either for the online MNE or in-person MS must register for NUCL 590. Up to 6 credits of NUCL 590 will count for credit for MNE and non-thesis MS students to use for a project. Students may take more than 6 credits, but these will not be counted toward the degree requirements. Graduate students who hold a graduate appointment must be registered for a minimum of three credits (either course or research hours) unless specifically excused by the Graduate School to register for Examination or Degree Only (see Section 4.4).

4.3 Registration for Seminar (NUCL 696)

Seminars are held in the School on a regular basis. The seminars bring outstanding nuclear scientists, engineers and others of significance to nuclear engineering to Purdue. All on campus graduate students registered for research or coursework are required to register for NUCL 696 in both fall and spring semesters. If the student has a scheduling conflict, he or she

should consult the seminar instructor before any anticipated absence.

Regular attendance is necessary to earn a grade of "Satisfactory" in NUCL 696 (attendance records are kept). Students are expected to participate in the discussions that follow the seminar lectures. Students with unexcused absences from the seminar should discuss this with the seminar instructor as soon as possible to avoid an "Unsatisfactory" grade. In the case of an unexcused absence in a seminar lecture, a student may be required to submit a two-page essay on the seminar topic based on the student's own study.

Every graduate student in the School of Nuclear Engineering is required to complete the online Collaborative Institutional Training Initiative's (CITI) Responsible Conduct of Research (RCR) training program within 60 days of starting a graduate program and every five (5) years thereafter. Details on the CITI training can be found at: https://about.citiprogram.org/en/series/responsible-conduct-of-research-rcr/. Each graduate student must submit a certificate of completion for the CITI training to the Student Services Office by the last day of classes in their first semester to receive a grade of "Satisfactory" for the seminar course. The certificate of completion will be retained in the student's file.

4.4 Registration in the Final Academic Session

When registering for the session in which a student expects to complete a degree, the student shall submit, in writing, a request or intent to graduate via email to the Student Services Office. In the semester the student plans to receive his or her degree, the Graduate School normally sends to the School a checklist of requirements yet to be met (candidate certification form); however, it is the student's responsibility to ensure that all requirements are met. Graduation deadlines are available on the Graduate School web page (http://www.purdue.edu/gradschool/about/calendar/) via the *Deadlines Calendar* link. Should the student fail to meet any of the graduation requirements by the deadline specified, he or she will not graduate in that semester and must register in the following semester.

All degree candidates should view the Graduate School website for guidance on preparing your thesis (https://www.purdue.edu/gradschool/research/thesis/).

If a student has completed all coursework but has failed to complete other requirements in time to graduate, he or she can take advantage of one of the following less expensive registration options as specified in Sections V. Registration of Graduate Students G.2.a and G.2.b of the Graduate School's Policies and Procedures for Administering Graduate Student Programs (https://catalog.purdue.edu/content.php?catoid=8&navoid=8243):

a. *Examination Only Registration.* A student who has completed the Graduate School's registration (30 hours credits for a master's degree; 90 hours credits for a Ph.D. degree) and who has finished all degree requirements except for the final examination and depositing the thesis prior to the first day of the academic session of graduation may request registration for examination only at a reduced fee. Thesis option students must also have been registered for at least one hour of 69800 or 69900 research credits, with a grade of S in the previous spring or fall session.

The previous session does not include the summer session unless:

- A graduate student completed work on degree requirements, requiring the appropriate number of registration credits;
- A graduate student held a graduate staff appointment during the preceding summer session. Graduate students who held a summer session appointment will be held to a minimum summer registration of three credits;
- A graduate student who did not hold a summer appointment will be held to a minimum registration for the preceding spring session.

If approved, this registration will remain valid only if both a positive Report of the Final Examination and a Thesis Receipt have been received in the Graduate School by the eighth week of the session (fourth week of an eight-week summer session). Otherwise, the Graduate School will notify the Office of the Registrar, after the eighth week of a semester or the fourth week of the summer session to register the student for one 69800 or 69900 credit. (Registration for candidates previously registered in absentia must be changed to a minimum of three credit hours of 69900. This will maintain the candidate's continuous registration in absentia and will make the student eligible to register for examination only or degree only in a future session.) If the student holds a graduate appointment, the department is responsible for changing the registration to no less than three credit hours of graduate-level course and/or 69800 or 69900 credits. Graduate staff employees enrolled for examination only should expect to pay Social Security tax on their graduate staff salaries. Likewise, graduate staff employees who do not meet the mid-session deadline for examination only and are enrolled for less than half-time should expect to pay Social Security tax on their graduate staff salaries.

Any graduate student, including those who hold any type of graduate appointment, may register for examination only.

b. *Degree Only Registration.* A student who has completed the Graduate School's registration requirement (30 hours for a master's degree; 90 hours for a Ph.D. degree) and who has finished all degree requirements except for depositing the thesis and for whom a positive Report of the Final Examination has been received in the Graduate School prior to the first day of the academic session of graduation but who has not been awarded the degree may request registration for degree only at a reduced fee. Thesis option students must also have been registered for at least one hour of research, with a grade of S in the previous spring or fall session.

The previous session does not include the summer session unless:

i. a graduate student completed work on degree requirements, requiring the appropriate number of registration credits;
ii. a graduate student held a graduate staff appointment during the preceding summer session. Graduate students who held a summer session appointment will be held to a minimum summer registration of three credits;
iii. a graduate student who did not hold a summer appointment will be held to a minimum registration for the preceding spring session.

If approved, this registration will remain valid only if a Thesis Receipt is received by the Graduate School by the eighth week of the session (fourth week of an eight-week summer session). Otherwise, the Graduate School will notify the Office of the Registrar, after the eighth week of a semester or the fourth week of the summer session to register the student for one 69800 or 69900 credit. (Registration for candidates previously registered in absentia must be changed to a minimum of three credit hours of 69800 or 69900. This will maintain the candidate's continuous registration in absentia and will make the student eligible to register for degree only in a future session.) If the student holds a graduate appointment, the department is responsible for changing the registration to no less than three credit hours of graduate-level course and/or 69800 or 69900 credits. Graduate staff employees enrolled for degree only should expect to pay Social Security tax on their graduate staff salaries. Likewise, graduate staff employees who do not meet the mid-session deadline for degree only and are enrolled for less than half-time should expect to pay Social Security tax on their graduate staff salaries.

Any graduate student, including those who hold any type of graduate appointment, may register for degree only.

4.5 Research in Absentia

Ph.D. students who have completed their coursework and Preliminary Examination, made significant progress on their thesis research topic, and established a plan for accomplishing research at a location away from campus may, with the approval of their advisor and the School Head, petition for permission to register for research in absentia. The formal request (Graduate School Form 12) must be received by the Graduate School at least one month prior to the beginning of the initial session for which absentia registration is sought.

4.6 Change of Duty Station

On occasion, the University is involved in projects requiring staff, including graduate students holding assistantships or fellowships, to be stationed off campus (either in the U.S. or abroad) for extended periods of time. If a graduate student engaged in such a project is to be paid by or through Purdue University, a change of duty station request is required. The student and advisor must arrange for the student to be registered each academic session during which the student receives a stipend. The level of registration should reflect as accurately as possible the anticipated contribution the research will make to the student's degree program.

4.7 Readmission and Transfer

Any graduate student who has not been enrolled for one semester or more (excluding summer sessions) must apply for readmission on Graduate School Form 1. Such readmission will be evaluated by the Graduate Committee. Transfer to or from another department requires a release by the Head of the original department, but the matter should first be discussed with the Graduate Chairpersons of the departments involved. It is required that students considering a transfer inform their advisor and the Graduate Chairperson well in advance of seeking the transfer. The School would like to minimize the impact of the transfer on ongoing research programs and on student support.

5.0 MASTER'S DEGREE PROGRAM

5.1 General

This degree program serves those seeking the Master of Science in Nuclear Engineering (MSNE) degree, the completely online Master of Nuclear Engineering (MNE) degree, and those

planning to work eventually toward the Ph.D. degree.

A student may obtain a MSNE degree from the School of Nuclear Engineering. MSNE Degree programs available are (1) thesis option and (2) coursework option. The MSNE degree requirements are listed in Table 5.1 and described more fully in the following sections. Note that the coursework option is typically intended for students planning to pursue a career in industry and is not encouraged for students interested in research and continuing for the Ph.D.. However, those students pursuing the Direct Ph.D. program will often complete a non-thesis MSNE degree prior to receiving their Ph.D..

Students should plan to finish their program in 2 to 4 semesters depending on their preparation. The combined Undergraduate/Graduate Program within the School normally enables students to begin their graduate programs earlier and finish the graduate program sooner (see Undergraduate/Graduate Program in Section 5.3 of this manual).

A student may obtain the totally online Master of Nuclear Engineering (MNE) degree from the School of Nuclear Engineering. The MNE degree offers a (1) project option and a (2) coursework option. The degree requirements are listed in Table 5.2 and described more fully in the following sections. Note that the project option is typically intended for students working in industry or a government laboratory and planning to choose a project related to their professional responsibilities.

5.2 Milestones in Pursuit of the MSNE Degree

The milestones and desired completion dates for MSNE degree students who are involved in research are listed below and described more fully in subsequent sections.

a. Selection of area of specialization, academic advisor (also referred to as major professor), and degree program (1st semester or as early as possible)
b. Preparation and approval of a POS (by the end of the 1st semester)
c. Identification of a research topic (2nd semester)
d. Completion of research work (2nd and 3rd semester)
e. Preparation of master's thesis (3rd or 4th semester)
f. Final examination (3rd or 4th semester)
g. Graduation procedures (see Section 5.2.7)

Steps c through f do not apply for the coursework option.

5.2.1 Selection of Area of Specialization and Faculty Advisor

Many students select an area of specialization and a faculty advisor prior to beginning the

first semester of graduate school. Often a student selects a graduate institution because it offers an opportunity to work in a particular area or with a particular professor. If an entering student does not have a faculty advisor, the default temporary advisor will be the Graduate Chairperson.

During the first semester of enrollment, the student with a temporary advisor will work with faculty members to identify an area of specialization and a faculty advisor. The student should talk with and visit the websites of as many Nuclear Engineering faulty members as possible to learn about their work. A faculty member will become a student's advisor only if the student and faculty member agree to establish that relationship. The faculty advisor is not responsible for providing financial support to the student. If the faculty advisor chooses to provide financial support, a formal offer letter is required for incoming graduate students. It is to the student's advantage, of course, to select a faculty advisor as soon as possible, but a faculty advisor must be selected no later than the last week of classes of the first semester of residency.

5.2.2 Preparation and Approval of the Master's Plan of Study (POS)

All students seeking a master's degree must file a POS. The POS should be approved before the end of the second semester of the student's registration; otherwise, the student may not be allowed to register for the next semester. A tentative POS should be submitted by the end of the first academic semester for master's students. It is important to note that the approved POS must be filed with the Graduate School prior to the first day of the academic session of graduation. The student will incur late fees due to a late submission. Additionally, students who do not meet this deadline will not be eligible to graduate that semester without special permission from the Graduate School. The POS may take weeks or months to process; therefore, early submission is highly recommended. Plans of Study are submitted electronically via the student's MyPurdue account located at http://www.mypurdue.purdue.edu.

Students should refer to the Electronic POS Checklist below to ensure successful submission.

1. Enter the student's full legal name, student identification number, and date of POS submission.
2. Enter the official departmental name (Nuclear Engineering) and code (E32).
3. Enter the official degree title (MSNE).
4. Enter a reasonable expected graduation date.
5. Enter an area of specialty (if applicable).
6. List coursework to be used for degree.

a. 24 credits of coursework should be listed, including core courses (NUCL 501, NUCL 504, NUCL 510, NUCL 520, NUCL 551, and 6 credits of Math, Computer Science, or other approved computational courses).
b. Research credits are not listed on the POS.

7. Enter the exact title and course number as it appears in MyPurdue.
8. Enter transfer courses from other institutions, exams, and certified undergraduate excess courses. This can add up to 9 credits for the MSNE degree.
    a. Certified undergraduate excess courses must be approved by the Registrar. Courses previously applied to an undergraduate degree are not eligible unless they are approved as part of the student's participation in the 4+1 (combined BS and non-thesis MS) program.
9. Enter the month and year the course was completed or is expected to be completed.
10. A majority of the courses in the POS should be 'Primary' (P) courses. Primary course standards are courses related to the student's major and research topic as decided upon by the Major Professor and graduate student. ALL core classes taken at Purdue (NUCL 501, 504, 510, 520, and 551) should be listed as Primary.
11. Enter the names and faculty identifier numbers of advisory committee members.
    a. Master's Thesis committees must consist of at least 3 graduate faculty members.
    b. Master's Non-Thesis committees must consist of 1 graduate faculty members.
    c. At least 51% of the committee members must be 'Regular' faculty members of the School, meaning they are permanent School faculty members and must have regular graduate faculty status.
12. Indicate each committee member's area of expertise.

At least one committee member must be from outside the School of Nuclear Engineering. Students can change their POS at any time. Each change requires the electronic submission of an updated POS that will be reviewed and approved by the student's faculty advisor, committee members, and the Graduate School.

5.2.2.1 Core Curriculum

The required core courses for nuclear engineering graduate students are NUCL 501 (nuclear engineering principles) NUCL 504 (radiation laboratory), NUCL 510 (reactor physics), NUCL 520 (reactor materials), and NUCL 551 (reactor safety). Students who took NUCL 200 and 300 at Purdue University are not required to take NUCL 501. Students who took NUCL 205 and NUCL 305 as undergraduates at Purdue University are not required to take NUCL 504. Students who took equivalent courses from peer institutions may have their courses reviewed for potential equivalences. Students from Purdue who took NUCL 200 AND NUCL 300 will NOT receive credit for NUCL 501. Students from Purdue who took NUCL 205 AND NUCL 305 will NOT receive credit for NUCL 504. The required core courses must be listed as Primary on the POS.

Students pursuing the thesis option must take a minimum of 24 hours of 500 or 600 level technical courses, including the core courses and 6 hours of mathematics, computer science, or other approved computational courses. The project-based courses are not allowed for thesis or course based MSNE degree. New technical courses with temporary number NUCL 597 (3 credits hours) with a course title up to 6 credit hours (2 separate courses) are allowed. The new NUCL 597 course should be an approved course by graduate committee and Head with details provided on course syllabus, meeting hours, evaluation method, and method of grading similar to regular graduate courses in nuclear engineering. Students may petition the Graduate Committee to waive the mathematics requirement if they have taken 500 or 600-level mathematics or computer science courses elsewhere. Students with undergraduate credit at Purdue for one or more of the core courses will have to take other 500 or 600 level technical courses to fulfill the 24-credit hour requirement. Any Purdue 500-level or 600-level technical course (Engineering, Physics, Computer Science, and Mathematics) is an acceptable elective if it is consistent with the student's program and objectives. Only 500 or 600 level courses are allowed towards course credits, including any undergraduate excess courses. For special circumstances, a student may include a maximum of 3 credit hours of a needed undergraduate course (NUCL 460) on his or her POS.

5.2.2.2 Transfer Credits and Undergraduate Excess Credit

A maximum of 9 credits of graduate-level courses taken as a graduate student at another university can be transferred to the master's POS provided that the student supplies adequate proof that each course was taken with the past five years, corresponds to at least a 500-level course at Purdue, and does not contain subject matter duplicated by the courses

taken here. Graduate 500 or 600-level courses the student has taken as an undergraduate, earned a grade of B or better (B- is not sufficient), and had certified as excess (see Undergraduate/Graduate Program in Section 5.3) may also be listed on the master's POS. A maximum of 9 credits may be obtained by transfer and undergraduate excess courses. Grades of B or better are required for all such courses.

5.2.2.3 Grade Requirements

A grade of B or better (B- is not sufficient) is required for each course appearing on the POS as a primary course. In addition, residency requirements must be met (see the Graduate School's Policy and Procedures Manual) and a minimum final grade point average of 3.0 is required. The student's faculty advisor routinely reviews each student's academic performance and will advise the student on performance not meeting the required standards.

5.2.2.4 Advisory Committee

The student, with faculty advisor assistance and approval, must assemble a master's advisory committee. For the thesis option, this committee consists of at least two permanent faculty members from the School and one member from outside the School with faculty certification known to be familiar with the area of research. For the non-thesis degree option, the committee should consist of at least one permanent School faculty member. In all cases, additional advisory committee members may be assigned as needed. Fifty-one percent of the advisory committee members must be regular graduate faculty members of the School. For special cases, S1 members can serve as co-chair as long as the student has one year or less to graduate.

5.2.3 Identification of a Research Topic and Funding of Research Work

The student and his or her advisor will work together to identify a research project of mutual interest. Students must be aware that the selection of a research project is typically influenced by the availability of funding. Faculty members write proposals for funding to support research they want to conduct. The budget for the project typically includes support for one or more graduate students. If the proposal is accepted, the faculty member receives the funding. Along with the funding, there is the responsibility to complete the proposed project on schedule. The graduate student's contributions are critical to the success of the project. Furthermore, success of the project is critical to the student since the future funding of a faculty member's research depends, in part, on past performance.

In ideal situations, a task within a faculty member's project becomes the graduate student's thesis research. A 50 percent research assistantship obligates the student to dedicate an average of 20 hours of concentrated effort per week to assigned tasks contributing directly to the success of the research project.

Another source of funding for a student's research project is external fellowships. A student with a major national fellowship is in a position to devote full time to his or her research, although that research is often closely aligned with the advisor's efforts. The National Science Foundation, Department of Energy, Department of Homeland Security, Department of Defense, and other government agencies have annual fellowship competitions. Nuclear Engineering graduate students with qualifications that make them competitive for a national fellowship are expected to apply. The College of Engineering and Graduate School hold workshops to provide tips on preparing strong applications.

5.2.4 Preparation and Deposit of Master's Thesis

The master's thesis should document research results in a clear and concise fashion, and it should be prepared while in residence. Faculty advisors will be the best guides on matters of organizing each individual thesis.

It is essential that a student writing a thesis give proper credit for any material or ideas from other work. Giving proper credit is a responsibility of every member of the scientific research community and failure to give credit (plagiarism) can result in severe academic or legal penalties. Plagiarism is defined in "Academic Integrity: A Guide for Students" (https://www.purdue.edu/odos/osrr/academic-integrity/) as follows:

"Plagiarism is a special kind of academic dishonesty in which one person steals another person's ideas or words and falsely presents them as the plagiarist's own product. This is most likely to occur in the following ways:

- using the exact language of someone else without the use of quotation marks and without giving proper credit to the author
- presenting the sequence of ideas or arranging the material of someone else even though such is expressed in one's own words, without giving appropriate acknowledgment
- submitting a document written by someone else but representing it as one's own."

More information on avoiding plagiarism can be found at:
https://www.purdue.edu/provost/researchIntegrity/plagiarism.html

Purdue University typically has a license to use a software package that allows a student to check his or her own work for plagiarism. Prior to submitting a thesis to the Advisory Committee for review in preparation for the final defense, the student should make every effort to check his or her own work for plagiarism. Effective September 1, 2014, Purdue's Graduate School requires that all theses and dissertations be reviewed using the iThenticate software and any issues identified by the software addressed prior to deposit of the final thesis or dissertation with the Graduate School. Satisfaction of this requirement will be certified by both major professor and degree candidate by certifying the following statement on the Electronic Thesis Acceptance Form [ETAF]: "Further, I certify that to the best of my knowledge this document is the original work of the author and all content from other authors appearing in the thesis/dissertation has been properly quoted and attributed. The author's manuscript was diagnostically reviewed by iThenticate on the date indicated as a determining factor in this assessment."

On the Thesis Acceptance Form (previously the form 9), the advisor is asked to attest that, to the best of his or her knowledge, the thesis does not contain plagiarized material, and the advisor may choose not to sign the Thesis Acceptance Form unless the student can demonstrate that the document has been checked for plagiarism.

Students should visit the Thesis/Dissertation Office website https://www.purdue.edu/gradschool/research/thesis/ before beginning preparation of their theses. The website provides students with links to 'Guidance', 'Format', 'Templates'', 'Required Forms' and 'Workshops'.

5.2.5 Final Examination

When the student and advisor agree that the thesis is complete, a final examination will be held by the advisory committee at a time acceptable to all committee members. To initiate the examination process, the student must inform the Student Services Office. The student will submit a (Graduate School Form 8). Form 8 through MyPurdue, which specifies the date, time and place of the exam, must be signed by the advisor and the Head of the School of Nuclear Engineering and must be submitted to the Graduate School at least two weeks prior to the date of the examination. At this time the student should also schedule a final deposit appointment with the Graduate School.

A final thesis draft copy of "original" quality, suitable for publication must be distributed

to the examining committee a minimum of 14 days prior to the scheduled final examination. A thesis delivered less than 14 days prior to the scheduled final examination may not be accepted. Prior to the final examination.

The final examination is scheduled for 2 hours. The student will make a formal presentation of about 45 minutes on his or her thesis. Anyone is welcome to attend the presentation, and typically those present will have an opportunity to ask questions during first hour. The second hour of the examination is a closed-door examination with only the student and examining committee present. The committee may ask questions about the thesis research and any related Nuclear Engineering concepts.

Upon successful completion of the final examination, the members of the examining committee will approve online the Report of Master's Examining Committee (previously known as Graduate School Form 7) and the advisor will complete online the Thesis Acceptance Form (previously known as Graduate School Form 9). This report is submitted electronically to secure the additional required signatures before being routed to the Graduate School.

The student will make the committee-recommended corrections and/or additions to the thesis. After changes are made, final approval of the thesis is secured by obtaining the signatures of the examining committee members and the Department Head on the thesis acceptance form. Once the Thesis Acceptance Form has been signed, the student will keep his or her deposit appointment with the Graduate School. At least 24 hours prior to the appointment, the student will submit the thesis via Electronic Thesis Deposit (ETD). Candidates submitting 'Confidential' ETDs must also bring their departmental library copy. If the thesis is acceptable, a Thesis Receipt (Graduate School Form 16) will be issued and should be delivered to the Graduate School before the end of the first working day following the last day of classes.

Students should visit the Thesis/Dissertation Office website https://www.purdue.edu/gradschool/research/thesis/ before beginning preparation of their theses. The website provides students with links to 'Guidance', 'Format', 'Templates'', 'Required Forms' and 'Workshops'.

5.2.6 Coursework Option

Since some exposure to research is considered an essential ingredient of most master's programs, the 30-hour coursework option is available to students anticipating a career in industry or pursuing the Direct Ph.D. program. All 30 hours must be comprised of coursework at Purdue

University. Students are responsible for the same requirements as MS thesis students with the exception of the final defense and deposit. Students performing the coursework option may pursue a non-thesis project either for the online MNE or in-person MS must register for NUCL 590. Up to 6 credits of NUCL 590 will count for credit for MNE and non-thesis MS students to use for a project. Students may take more than 6 credits, but these will not be counted toward the degree requirements.

The course-based MS degree is a terminal degree. Those seeking a Ph.D. afterwards must apply for Ph.D. degree admission to the School of Nuclear Engineering.

5.2.7 Graduation Procedures

Students must meet all deadlines set by the Graduate School and the Office of the Registrar to graduate in a particular semester. It is the student's responsibility to know and meet these deadlines. The Graduate School deadlines can be found online at https://www.purdue.edu/gradschool/about/calendar/index.html . The Office of the Registrar's candidacy requirements and directives can be found online at http://www.purdue.edu/commencement/students/. Students will incur late fees for late submission of the Electronic POS to the Graduate School, declaration of candidacy beyond the deadline, and/or listing on the Graduate School's candidate roster for the same degree more than two consecutive sessions in a row. To avoid late fees with the Graduate School, a student must adhere to the posted deadlines.

After meeting all academic requirements, the following checklist addresses some administrative details that must be addressed:

a. Complete the Checkout Sheet (sent electronically from the Student Services Office) and return keys to the Main Office. Please note that failure to complete and return this form may result in non-approval of the candidate certification and failure to graduate.
b. All research materials accumulated during a student's tenure, including the yellow copy of the laboratory notebook and appropriate electronic files and codes, should be turned in to the student's supervisor, if applicable. In the case of certain sponsored programs, the University has a legal custodial responsibility for such materials.

The project-based MNE degree is a terminal degree. Those seeking a Ph.D. afterwards must apply for Ph.D. degree admission to the School of Nuclear Engineering.

5.3 Milestones in Pursuit of the Online MNE Degree

The following milestones and desired completion dates are suggested for MNE degree students pursuing the project option.

a. Selection of an area of specialization, academic faculty advisor (also referred to as major professor) (1st or 2nd semester or as early as possible)
b. Selection of project topic (1st or 2nd semester or as early as possible)
c. Preparation and approval of a POS (2nd or 3rd semester registration)
d. Completion of the project (4th)
e. Preparation of the project report (4th or 5th semester)
g. Graduation procedures (see Section 5.3.7)

Steps b, d, and e do not apply for the coursework option.

5.3.1 Selection of Area of Specialization and Project Advisor

Students with a project may select an area of specialization for the project and an advisor for the project prior to beginning the first semester of graduate school. Often, a student selects a graduate institution because it offers an opportunity to work in a particular area or with a particular professor. If an entering student does not have an advisor, the default temporary advisor will be the Graduate Chairperson. For the project option, the Graduate Chairperson serves as the default advisor for the degree program.

During the first semester of enrollment, the student will work with the Graduate Chairperson to identify an area of specialization for the project and an advisor for the project. The student should talk with and visit the websites of as many Nuclear Engineering faulty members as possible to learn about their work. A faculty member will become a student's project advisor only if the student and faculty member agree to establish that relationship.

5.3.2 Preparation and Approval of the MNE Plan of Study (POS)

All students seeking a MNE degree must file a POS. The POS should be approved before the end of the second semester of the student's registration. It is important to note that the approved POS must be filed with the Graduate School prior to the first day of the academic session of graduation. The student will incur late fees for late submission. Additionally, students who do not meet this deadline will not be eligible to graduate that semester without special permission from the Graduate School. The POS may take weeks or months to process; therefore,

submitting as soon as possible is highly recommended. Plans of study are submitted electronically via the student's MyPurdue account located at http://www.mypurdue.purdue.edu.

Students should refer to the Electronic POS Checklist below to ensure successful submission.

1. Enter the student's full legal name, student identification number and date the POS is submitted.
2. Enter the official departmental name (Nuclear Engineering) and code (E32).
3. Enter the official degree title (MNE).
4. Enter a reasonable expected graduation date.
5. Enter an area of specialty (if applicable).
6. List coursework to be used for degree.
    a. 24 credits of coursework should be listed, including core courses (NUCL 501, NUCL 510, and NUCL 551).
    b. Project credits are not listed on the POS.
7. Enter the exact title and course number as it appears in MyPurdue.
8. Enter the month and year the course was completed or is expected to be completed.
9. A majority of the courses in POS should be Nuclear Engineering courses as 'Primary' (P) courses. Primary course standards are courses related to student's major and are decided upon by the Advisor and graduate student. ALL core classes taken at Purdue (NUCL 501, 510, and 551) should be listed as Primary.
10. Enter the name and faculty identifier number of Advisor.

Each time a change is made an updated POS will need to be submitted electronically and receive approval from the student's advisor and the Graduate School.

5.3.2.1 Core Curriculum

The required core courses for nuclear engineering graduate students are online NUCL 501 (nuclear engineering principles), NUCL 510 (reactor physics), and NUCL 551 (reactor safety). Students who took NUCL 200 and 300 at Purdue University are not required to take NUCL 501 and will not receive credit toward graduation by taking NUCL 501; they will need to take another approved 500 or 600 level course to achieve the required total number of credit hours for

graduation. Students who took equivalent courses from peer institutions courses may have their courses reviewed for potential equivalences.

Students pursuing the project option must take a minimum of 24 hours of 500 or 600 level technical courses, including the core courses. The majority of courses (18 credit for course option 12 credits for project option) must be Purdue offered online Nuclear Engineering courses.

New online technical courses with temporary number NUCL 597 (3 credits hours) with a course title up to 6 credit hours (2 separate courses) are allowed. The new NUCL 597 course should be an approved course by Advisor and Head with details provided on course syllabus, meeting hours, evaluation method, method of grading similar to regular graduate courses in nuclear engineering. Any Purdue online 500-level or 600-level technical course is an acceptable elective provided that it is consistent with the student's program and objectives.

5.3.2.2 Grade Requirements

A grade of B or better (B- is not sufficient) is required for each course appearing on the POS as a primary course. The student's faculty advisor routinely reviews each student's academic performance and will advise the student if his or her performance is not meeting the required standards.

5.3.3 Identification of a Project Topic

The student and his or her advisor will work together to identify a project topic of mutual interest. Typically, a student may choose a topic from his/her industrial experience or profession related topic.

5.3.4 Preparation and Deposit of Project

The project report should document research results in a clear and concise fashion, and it should be prepared like a thesis. The faculty advisor will be the best guide on matters of organization for each individual project report

It is essential that a student writing a project give proper credit for any material or ideas from other work. Giving proper credit is a responsibility of every member of the scientific research community and failure to give credit (plagiarism) can result in severe academic or legal penalties. Plagiarism is defined in "Academic Integrity: A Guide for Students" (https://www.purdue.edu/odos/osrr/academic-integrity/) as follows:

"Plagiarism is a special kind of academic dishonesty in which one person steals another person's ideas or words and falsely presents them as the plagiarist's own product. This is most likely to occur in the following ways:

- using the exact language of someone else without the use of quotation marks and without giving proper credit to the author
- presenting the sequence of ideas or arranging the material of someone else even though such is expressed in one's own words, without giving appropriate acknowledgment
- submitting a document written by someone else but representing it as one's own."

More information on avoiding plagiarism can be found at:
https://www.purdue.edu/provost/researchIntegrity/plagiarism.html

Purdue University typically has a license to use a software package that allows a student to check his or her own work for plagiarism. Prior to submitting a project report to the Advisor for review in preparation for approval, the student should make every effort to check his or her own work for plagiarism. Effective September 1, 2014, Purdue's Graduate School requires that all written documents or reports be reviewed using the iThenticate software and any issues identified by the software addressed prior to deposit of the final report with the Advisor. Satisfaction of this requirement will be certified by both major professor and degree candidate by certifying the following statement on the Electronic Thesis Acceptance Form [ETAF]: "Further, I certify that to the best of my knowledge this document is the original work of the author and all content from other authors appearing in the report has been properly quoted and attributed. The author's manuscript was diagnostically reviewed by iThenticate on the date indicated as a determining factor in this assessment."

On the Project Acceptance Form, the advisor is asked to attest that, to the best of his or her knowledge, the thesis does not contain plagiarized material, and the advisor may choose not to sign the Project Acceptance Form unless the student can demonstrate that the document has been checked for plagiarism.

Students should visit the Thesis/Dissertation Office website https://www.purdue.edu/gradschool/research/thesis/ before beginning preparation of their theses. The website provides students with links to 'Guidance', 'Format', 'Templates'', 'Required Forms' and 'Workshops'.

5.3.5 Coursework Option

All 30 hours must be comprised of coursework from the Purdue University Online program. Course based online MNE degree is a terminal degree. Those seeking a Ph.D. afterwards should apply for Ph.D. degree admission to the School of Nuclear Engineering.

5.3.6 Graduation Procedures

Students must meet all deadlines set by the Graduate School and the Office of the Registrar to graduate in a particular semester. It is the student's responsibility to know and meet these deadlines. The Graduate School deadlines can be found online at https://www.purdue.edu/gradschool/about/calendar/index.html. The Office of the Registrar's candidacy requirements and directives can be found online at http://www.purdue.edu/commencement/students/. Students will incur late fees for late submission of the Electronic POS to the Graduate School, declaration of candidacy beyond the deadline, and/or listing on the Graduate School's candidate roster for the same degree more than two consecutive sessions in a row. To avoid late fees with the Graduate School, a student must adhere to the posted deadlines.

5.4 Undergraduate/Graduate Program

Nuclear Engineering undergraduates at Purdue University may apply for graduate admission with the approval of the School and the permission of the Dean of the Graduate School, and be admitted to the Graduate School in the session in which the baccalaureate degree is being completed. This program helps students focus on their graduate coursework at an earlier stage and, most importantly, begin to become familiar with a research area and a particular research group in the School. This normally accelerates their graduate program and is typically used to provide an additional opportunity for financial support during the undergraduate program if funds are available.

Early admission to the Graduate School is usually required only if the student is to receive a graduate staff appointment. If early admission is required, the student must submit a complete application and supporting documents at least two months prior to the desired session of entrance. Otherwise, early admission is not required for undergraduate students wishing to begin graduate study. The student may simply use *Registrar's Form 350* to designate a graduate course as excess of baccalaureate requirements. This form is available from the Student Services

Office. The completed form must be submitted to the instructor of the course to be taken for graduate credit at the beginning of the academic session in which the course will be taught to earn graduate credit. The instructor must submit the form with the course grades at the end of the session, indicating successful completion at the graduate level. A maximum of 9 hours of graduate credit for such courses with grades of B or better will be granted only after the student has been awarded an undergraduate degree, achieved a minimum GPA of 3.00, and obtained approval of the Nuclear Engineering Head.

TABLE 5.1
MSNE DEGREE REQUIREMENTS

	THESIS OPTION	COURSEWORK OPTION	DIRECT Ph.D. PROGRAM
Credits Required	30	30	30
Courses Required	24*	30	30*
Thesis Credit	6 hrs. NUCL 698	0	0
Transfer Credits Maximum Total from Outside or from Undergraduate Excess (Grade A or B Only)	9	9	9
Final Exam	Thesis Defense	N/A	Ph.D. Preliminary Exam
Advisory/Exam Committee Minimum Members	3	1	4
Advisory/Exam Committee Minimum Outside Nuclear Engineering	1	0	1
Common Requirements	GPA greater than or equal to 3.0, A or B Grades on all primary courses on the POS, Residence Requirements met (see Graduate School Policies and Procedures Manual)		

* Including 6 hours of approved math, computer science, or other computational courses.

TABLE 5.2
MNE DEGREE REQUIREMENTS

	PROJECT OPTION	COURSEWORK OPTION
Credits Required	30	30
Courses Required	24	30
Project Credit	6 hrs. NUCL 590	0
Advisory	1	1
Requirements	GPA greater than or equal to 3.0, A or B Grades on all primary courses on the POS	

TABLE 5.3 – SCHOOL GRADUATE FACULTY IDENTIFICATION NUMBERS	
NAME:	FACULTY ID:
Abdel-Khalik, Hany	C9268
Bindra, Hitesh	C12114
Chatzidakis, Stylianos	C11461
Choi, Chan K.	C2505
Garner, Allen	C8592
Hassanein, Ahmed	C7198
Ishii, Mamoru	C3183
Kim, Seungjin	C10160
Lopez, de Bertodano, Martin	C3940
Lou, Xiaoyuan	C12115
Revankar, Shripad	C4869
Sizyuk, Valeryi	C7919
Taleyarkhan, Rusi	C6127
Tsoukalas, Lefteri	C4361
Xu, Yunlin	C10621

6.0 THE PH.D. DEGREE PROGRAM

6.1 General

This program is open to students who have successfully earned their master's degree or have successfully completed the requirements for our "Direct Ph.D. Program". Based on past experience, a minimum of 2 to 3 calendar years is typically necessary to complete all degree requirements for students arriving with a master's degree and 3 to 4 years for the Direct Ph.D. Program. The degree requirements for the Ph.D. are listed in Table 6.4. Milestones in the Ph.D. program are indicated below. Students who significantly deviate from the milestone sequence should be aware of the Ph.D. program time limitations discussed in Section 6.3.

6.2 Milestones in Pursuit of the Ph.D. Program:

a. Selection of Area of Specialization and Academic Advisor - also referred to as Major Professor (1st semester)
b. Identification of Thesis Topic (as early as possible)
c. Passing of the Ph.D. Qualifying Examination (2nd semester after M.S.N.E., 4th semester after M.S. other than in N.E., or 2nd or 4th semester after B.S. for students intending to enroll in the "Direct Ph.D. Program")
d. Preparation and approval of a Ph.D. POS (3rd semester - required for 4th semester registration)
e. Preliminary examination (after passing the qualifying examination)
f. Preparation of Ph.D. dissertation
g. Preparation of a scholarly journal paper
h. Defense of Ph.D. dissertation (typically 6th semester after master's degree or entry with master's degree or 7th semester after bachelor’s degree for "Direct Ph.D. Program")
i. Graduation Procedures

These milestones are discussed in detail in the following sections.

6.2.1 Selection of Area of Specialization and Academic Advisor

Many students select an area of specialization and an advisor prior to beginning the first semester of graduate school. Often a student selects a graduate institution because it offers an opportunity to work in a particular area or with a particular professor. If an entering student does not have an advisor, a temporary one will be appointed by the Head for the student's first semester of enrollment. Often the default temporary advisor will be the Graduate Chairperson.

During the first semester of enrollment, the student with a temporary advisor will work with faculty members to identify an area of specialization and a faculty advisor. The student should talk with as many Nuclear Engineering faulty members as possible to learn about their work. A faculty member will become a student's advisor only if the student and faculty member agree to establish that relationship. The faculty advisor is not responsible for providing financial support to the student. If the faculty advisor chooses to provide financial support, a formal offer letter is required. It is to the student's advantage, of course, to select a faculty advisor as soon as possible, but an advisor must be selected no later than the last week of classes of the first semester of residency.

The discussions that lead to the choice of a faculty advisor will normally include a discussion of the dissertation topic, at least in a general form. It is important for the student to start reviewing the technical area and to initiate discussions with the faculty advisor on the topic as soon as possible.

6.2.2 The Ph.D. Plan of Study (POS)

All students seeking a Ph.D. must file a POS. Plans of study are submitted electronically via students' MyPurdue account located at http://www.mypurdue.purdue.edu. The POS must be approved before the end of the third semester of the student's registration.

Students should refer to the Electronic POS Checklist below to ensure successful submission.

1. Enter the student's full legal name, student identification number, and date the POS is submitted.
2. Enter the official departmental name (Nuclear Engineering) and code (E32).
3. Enter the official degree title (Doctor of Philosophy).
4. Enter a reasonable expected graduation date.
5. Enter an area of specialty (if applicable).

6. List coursework to be used for degree.
    a. 48 credits of coursework should be listed, including core courses (NUCL 501, NUCL 504, NUCL 510, NUCL 520, NUCL 551, three 600 level graduate courses, and 6 credits of approved math, computer science or other approved computational courses).
    b. Research credits are not listed on the POS.
7. Enter the exact title and course number as it appears in MyPurdue.
8. Enter transfer courses from other institutions, exams and certified undergraduate excess courses.
    a. Certified undergraduate excess courses must be approved by the Registrar. Courses previously applied to an undergraduate degree are not eligible.
9. Enter the month and year the course was completed or is expected to be completed.
10. A majority of the courses in POS should be 'Primary' (P) courses. Primary courses include the required course courses and courses related to student's major as decided upon by the Major Professor and graduate student.
11. Enter the names and faculty identifier numbers of committee members.
    a. Ph.D. committees should consist of at least 4 graduate faculty members.
    b. At least 51% of the committee members must be 'Regular' faculty members of the School, meaning they are permanent School faculty members and must have regular graduate faculty status.
    c. At least one member must be from outside the School of Nuclear Engineering (i.e., not a 'Regular' faculty member of the School)
12. Indicate each committee member's area of expertise.
    a. At least one member must be from outside Nuclear Engineering.

6.2.2.1 Core Curriculum

The required core courses for nuclear engineering graduate students are NUCL 501 (nuclear engineering principles), NUCL 504 (radiation laboratory), NUCL 510 (reactor physics), NUCL 520 (reactor materials) and NUCL 551 (reactor safety). Students without a Purdue University undergraduate nuclear engineering background and did not complete NUCL 200 and 300 (or approved equivalent courses at a peer institution) are required to complete NUCL 501 (nuclear engineering principles) as well as NUCL 504, 510, 520 and 551. Students who took

NUCL 205 and NUCL 305 at Purdue (or approved equivalent courses at a peer institution) are not required to take NUCL 504.

Students must take a minimum of 48 hours of 500 or 600 level technical courses, including the core courses and 6 hours of approved math, computer science, or other computational courses. Project-based courses are not allowed for course credit. New technical courses with temporary number NUCL 597 (3 credits hours) with a course title up to 6 credit hours (2 separate courses) are allowed. The new NUCL 597 course should be an approved course by graduate committee and Head with details provided on course syllabus, meeting hours, evaluation method, and method of grading similar to regular graduate courses in nuclear engineering. Students may petition the Graduate Committee to waive the mathematics requirement if they have taken 500-level (or higher) mathematics or computer science courses elsewhere. If a student has undergraduate credit at Purdue for one or more of the core courses, he or she will take other 500 or 600 level technical courses to fulfill the 48 credits hours requirement. Any Purdue 500-level or 600-level technical course is an acceptable elective provided that it is consistent with the student's program and objectives. The Ph.D. POS must include at least three 600 level courses. For special circumstances, a student may include a maximum of 3 credit hours of a needed undergraduate course NUCL 460 on his or her POS.

6.2.2.2 Transfer Credits and Undergraduate Excess Credit

A maximum of 9 hours of graduate-level courses taken elsewhere as a graduate student can be transferred to the master's POS provided that the student supplies adequate proof that each course corresponds to at least a 500-level course at Purdue and that the subject matter is not duplicated by the courses taken here. Graduate 500 or 600-level courses (or NUCL 460) the student has taken as an undergraduate, earned a grade of B or better (B- is not sufficient), and had certified as excess (see Undergraduate/Graduate Program in Section 5.3) may also be listed on the master's POS. A maximum of 9 credits may be obtained by transfer and undergraduate excess courses. A maximum of 24 hours of coursework from one (and only one) master's degree may be used on the POS for a doctoral degree provided that the student supplies adequate proof that each course corresponds to at least a 500-level course at Purdue and that the subject matter is not duplicated by courses taken here.

6.2.2.3 Grade Requirements

A grade of B or better (B- is not sufficient) is required for each course appearing on the POS as a primary course. In addition, residency requirements must be met (see the Graduate School’s Policy and Procedure Manual) and a minimum final grade point average of 3.0 is

required. The student's faculty advisor routinely reviews each student's academic performance and will advise the student if performance does not meet the required standards.

6.2.2.4 Advisory Committee

The student, with the help and approval of their faculty advisor, must assemble a Ph.D. Advisory Committee. This committee must consist of at least four members, including at least three permanent faculty members from the School and one member from another discipline with faculty certification known to be familiar with the area of research. This close familiarity is expected to best fulfill the "advisory" and the eventual "examination" character of this committee. Additional members may be assigned as needed. Fifty-one percent of the advisory committee members are permanent School faculty members and must be regular graduate faculty members. For special cases, S1 members can serve as co-chair as long as the student has passed the Preliminary Exams and has one year or less to graduate.

6.2.3 The Ph.D. Qualifying Examination

The purpose of the Ph.D. qualifying examination is to help determine as early as possible whether a student has the capability and background to conduct the original, independent research that is required in the Ph.D. program. Only students admitted to the Ph.D. degree program are allowed to take the Ph.D. qualifying examination.

Students should take the qualifying examination within 2 semesters of completing the M.S. in nuclear engineering or within 2 semesters of completing the BS degree for those students who are in the direct Ph.D. program. Students entering the Nuclear Engineering graduate program with an M.S. in a field other than nuclear engineering should take the qualifying examination within 4 semesters after enrolling in the nuclear engineering program.

The examination is administered by the faculty once a year, in the spring semester, with the Graduate Chairperson serving as the coordinator. The exam will consist of (1) a written portion testing the student's general knowledge of fundamental nuclear engineering concepts and (2) a combined research assessment paper and oral examination covering the student's selected area of specialization. The approximate timeline for the examination will be

- Around the end of November, students will receive a journal paper that will be the basis for the written research assessment paper.
- Around one week before the written examination, students will turn in the written research assessment paper.
- Around the first week of February, students will take the written general

knowledge examinations.

- Around the third week of February, students will take the oral portion of the exam in the area of specialization.
- Around the second week of March, students will be notified of their final grades on the exam.

A comprehensive list of the concepts with which a student should be familiar for each portion of the written exam and each specialization area will be prepared by the faculty members responsible for each examination.

Around the middle of October, the Graduate Chairperson will hold a briefing to discuss the qualifying examination. The topics for the written portion of the exam will be provided during the briefing. By the end of November (the specific date will be provided in the briefing), students planning to take the qualifying examination must register with the Student Services Office and indicate in writing with a formal registration form. If a student subsequently withdraws from the examination, the exam will be considered a failure except in cases of extenuating circumstances.

6.2.3.1 General Knowledge Portion of the Exam

Each student will be required to take two 90-minute written general examinations. The two areas of the exams are listed below along with the courses in which topics in these areas are currently taught.

1. Nuclear Engineering Principles and Reactor Physics (NUCL 300 and 310 or 510)
2. Nuclear Structure and Radiation Interactions (NUCL 200, 300, 205, and 305 or 501 and 504)

The students will take the written exams in one day in two separate 90 minute sessions. Students will receive one exam at the beginning of the first session and turn it in after the 90-minute period. After a break, the students will take the second exam and will have 90 minutes to complete it. The exams will be closed book. Each examination will be prepared by two faculty members who have recently taught courses related to the area of the exam.

In addition to basic knowledge of nuclear engineering fundamentals, the two written examinations will measure qualities such as ability to think logically and analytically, communication skills, problem definition, insight, creativity, synthesis and the ability to formulate solutions. A mastery of basic mathematics, physics, engineering science, and nuclear engineering is expected.

6.2.3.2 Research Assessment Paper and Oral Exam in Area of Specialization

Each student registering to take the qualifying exam will indicate an area of specialization. The current areas of specialization are fusion, materials, thermal-hydraulics and reactor safety, nuclear structure and radiation interactions, reactor physics, AI and cybersecurity. (Over time, the areas of specialization will change as the faculty, students, and external conditions change.)

The examination in the area of specialization will be conducted by an Area Committee consisting of faculty members (typically 3 members) with expertise in the area. The student's advisor will serve as a member of the Area Committee conducting the examination. The Area Committee will select the archival journal paper for the student to read, grade the written research assessment paper, and conduct the oral portion of the specialization exam.

The student will be assigned one archival journal paper in his or her area of specialization to read, summarize, critique, and extend. The summary of the paper will demonstrate the student's understanding of the material. The critique will include both the student's own evaluation of the work and a comparison with work of other researchers in the area. It will also include a discussion of the impact of the paper and place the paper in historical perspective. In the extension, the student will identify important questions raised by the paper, gaps in the research, or substantive weaknesses in the paper. The student will then make a preliminary attempt to address the questions or gaps or otherwise strengthen the paper. An outline of the paper to be written will be provided. The research assessment paper prepared by the student should be double spaced and approximately 15-20 pages long, exclusive of title page, table of contents, abstract, nomenclature, figures, tables, and references.

When the student picks up the archival journal paper to be read, the student will be asked to sign a form indicating receipt of the research assessment package (article to read, outline of paper the student is to write, and due date) and agreement to work independently. In addition, the student will acknowledge receipt of a statement that detection of plagiarism in the written assessment paper will result in a failing grade for the research assessment paper and oral examination and may be subject to further disciplinary action. Written papers submitted by the students will be independently graded by each member of the Area Committee conducting the exam in the area of specialization and will be checked for plagiarism.

The oral examination in the area of specialization will be 2 hours long. The student will give a 30-minute presentation on his or her research assessment paper. Following the presentation, the Area Committee members will ask questions related to research assessment paper in the first hour and related topics in the area of specialization for the second hour.

6.2.3.3 Examination Result

Following the oral portion of the exam, the Head of the School of Nuclear Engineering will inform each student in writing of the results of the exam. The student must pass both portions of the written general exam and the complete specialization area exam (combined written research assessment paper and oral examination) to enter the Ph.D. program. Students who fail any portion of the exam will have a second opportunity to take the portion(s) of the exam that they did not pass the first time. Those students must take the failed portions of the exam immediately the next time the qualifying examination is offered.

6.2.4 Identification of Dissertation Topic

Identifying a research topic that will make a unique contribution to the body of knowledge is one of the most challenging tasks faced by a Ph.D. student. This task is highly dependent upon the research opportunities that exist at the time and the manner in which the student and the research are supported. If a student requires support for research, then the topic is typically constrained to those areas for which current research contracts or grants exist. In the case of self-supported students or fellowship recipients, the main concern will be to find a topic consistent with the interests of the faculty advisor and/or advisory committee. In this case, considerable latitude is possible, and the student should discuss his or her ideas with the faculty members.

The National Science Foundation, Department of Energy, Department of Homeland Security, Department of Defense, and other government agencies have annual fellowship competitions. Nuclear Engineering graduate students with qualifications that make them competitive for a national fellowship are expected to apply. The College of Engineering and Graduate School hold workshops to provide tips on preparing strong applications.

6.2.5 Direct Ph.D. Program

The Direct Ph.D. Program is available for students with outstanding academic records. This program enables students entering with a bachelor's degree to obtain the Ph.D. degree without investing time in preparing a formal master's degree thesis. It also allows greater flexibility in course selection and research planning.

The direct Ph.D. student can apply for the MSNE degree while working towards the Ph.D. To receive a master's degree in the Direct Ph.D. Program, students must adhere to all the procedures and requirements set forth by the Graduate School. The master's degree will be conferred to students in this program upon successful completion of the Ph.D. preliminary

examination (see Section 6.2.6) and submission of an acceptable master's POS. The master's POS must be submitted in the semester prior to the preliminary examination to receive the degree at the end of the semester in which the preliminary examination is taken. This master's program is a non-thesis option.

6.2.6 Ph.D. Preliminary Examination

The purpose of the Ph.D. preliminary examination is to establish that a suitable research topic has been defined and adequate preparation to embark on the research has been made. The examination consists of a written research proposal and a 2-hour oral examination. The examination committee normally consists of the student's Ph.D. Advisory Committee. In case an advisory committee member is unavailable, a substitute may be appointed but must be approved by the Graduate School.

The research proposal should clearly explain the objectives to be accomplished, how such objectives relate to previous work in the area, the significance of the proposed work, and the approach to be followed. The originality of the objectives and/or approach should be stressed. The proposal should also include the results of an extensive literature survey. The literature survey is important because it helps members of the committee assess the student's knowledge of previous work. The depth and clarity of the presentation should give evidence of a reasonable degree of maturity in the student's knowledge of the field.

The research proposal should be distributed to the Examination Committee no later than 14 days prior to the scheduled preliminary examination. The Graduate School must receive a formal request for the appointment of the Preliminary Examining Committee and the scheduling of the preliminary examination (Graduate School Form 8, obtained from the Graduate School web page) no later than two full weeks prior to the examination. This is typically handled by the Student Services office after written notification from the student.

The examination normally begins with a brief oral presentation in which the student is expected to communicate the key elements of the research proposal. This is followed by a question-and-answer session in which the Examination Committee may probe a variety of areas including: the student's understanding of the research topic and its significance, the student’s understanding of related previous work, and the viability of the proposed approach as a whole or any part of it (particularly regarding proposed experimental and theoretical techniques). Other students, after receiving permission from the committee and examinee, may attend the presentation portion of the exam.

If the report of the Examination Committee is favorable, the student will be formally

reclassified as a candidate for the degree of Doctor of Philosophy. If the report is unfavorable, the student may repeat the examination if the Examination Committee recommends. Should the preliminary examination be failed twice, the student may not be given a third examination, except upon the recommendation of the Examination Committee and with special approval of the Graduate Council.

A recommendation by the Examining Committee for the student to take one or two additional courses not appearing on the POS is not incompatible with a recommendation that the student be admitted to candidacy.

6.2.7 Preparation and Deposit of the Ph.D. Dissertation

The Ph.D. dissertation should "argue" the significance for the research document and "argue" that what was done was valid, and "argue" that the interpretation and conclusions are valid. A Ph.D. dissertation is supposed to provide a significant advance of understanding in a given area (field) and to communicate this advance in a readily comprehensible form. Previous Ph.D. theses in the School may be found in the Engineering Library to provide an overall perspective of the magnitude of the effort. A student's advisor will be the best guide on matters of organization of the dissertation. For this reason, as well as having access to other Committee members, the dissertation should be prepared while in residence.

It is essential that a student writing a dissertation give proper credit for any material or ideas from other work. Giving proper credit is a responsibility of every member of the scientific research community and failure to give credit (plagiarism) can result in severe academic or legal penalties. Plagiarism is defined in “Academic Integrity: A Guide for Students” (https://www.purdue.edu/odos/osrr/academic-integrity/) as follows:

“Plagiarism is a special kind of academic dishonesty in which one person steals another person's ideas or words and falsely presents them as the plagiarist's own product. This is most likely to occur in the following ways:

- using the exact language of someone else without the use of quotation marks and without giving proper credit to the author
- presenting the sequence of ideas or arranging the material of someone else even though such is expressed in one's own words, without giving appropriate acknowledgment
- submitting a document written by someone else but representing it as one's own.”

Purdue University typically has a license to use a software package that allows a student to check his or her own work for plagiarism. Prior to submitting a thesis to the Advisory Committee for review in preparation for the final defense, the student should make every effort

to check his or her own work for plagiarism. Effective September 1, 2014, Purdue's Graduate School requires that all theses and dissertations be reviewed using the iThenticate software and any issues identified by the software addressed prior to deposit of the final thesis or dissertation with the Graduate School. Satisfaction of this requirement will be certified by both major professor and degree candidate by certifying the following statement on the Electronic Thesis Acceptance Form [ETAF]: "Further, I certify that to the best of my knowledge this document is the original work of the author and all content from other authors appearing in the thesis/dissertation has been properly quoted and attributed. The author's manuscript was diagnostically reviewed by iThenticate on the date indicated as a determining factor in this assessment."

On the Thesis Acceptance Form (previously the form 9), the advisor is asked to attest that, to the best of his or her knowledge, the thesis does not contain plagiarized material, and the advisor may choose not to sign the Thesis Acceptance Form unless the student can demonstrate that the document has been checked for plagiarism.

Students should visit the Thesis/Dissertation Office website https://www.purdue.edu/gradschool/research/thesis/ before beginning preparation of their theses. The website provides students with links to 'Guidance', 'Format', 'Templates'', 'Required Forms' and 'Workshops'.

6.2.8 Final Examination

When the student and faculty advisor agree that the dissertation is complete, a final examination will be held by the advisory committee at a time acceptable to all committee members. To initiate the examination process, the student will submit a Form 8 by logging into MyPurdue. Form 8, which specifies the date, time, and place of the exam, must be signed by the advisor and the Head of the School of Nuclear Engineering and must be submitted to the Graduate School at least two weeks prior to the date of the examination. At this time, the student should also schedule a final deposit appointment with the Graduate School.

A final dissertation draft copy of "original" quality, suitable for publication must be distributed to the examining committee a minimum of 14 days prior to the scheduled final examination. A dissertation delivered less than 14 days prior to the scheduled final examination may not be accepted. Prior to the final examination, the Student Services Office will provide the advisor with the Assessment Rubrics for each committee member.

The final examination is scheduled for 2 hours. The student will make a formal

presentation of about 45 minutes on his or her dissertation. The oral presentation by the candidate conveys the nature of the research work and the accomplishments. Anyone is welcome to attend the presentation, and typically those present but not on the examining committee will have an opportunity to ask questions during the first hour. The second hour of the examination is closed door with only the student and examining committee present. The second hour is typically devoted to discussion and questioning by the members of the examination committee. The student's task is to "defend" the methods, results, and conclusions as valid. In addition, the committee should be convinced that the student has made an original and significant contribution.

Upon successful completion of the final examination, the members of the examining committee will record the results via the electronic Form 8, which will then be sent to the appropriate people for their signatures. Once all signatures are gathered, the Graduate School will be the last to approve.

The student will make committee-recommended corrections and/or additions to the dissertation. After changes are made, final approval of the dissertation is secured by obtaining the signatures of the examining committee members, the Department Head, and Department Thesis Format Advisor (Academic Program Administrator) on the Thesis Acceptance Form. Once the Thesis Acceptance Form (previously the Form 11) has been approved online, the student will keep his or her deposit appointment with the Graduate School. At least 24 hours prior to the appointment, the student will submit the dissertation via Electronic Thesis Deposit (ETD). Candidates submitting 'Confidential' ETDs must also bring their departmental library copy. If the dissertation is acceptable, a Thesis Receipt (Graduate School Form 16) will be issued and should be delivered to the Graduate School before the end of the first working day following the last day of classes. A copy should be delivered to the Student Services Office.

6.2.9 Graduation Procedures

Students must meet all deadlines set by the Graduate School and the Office of the Registrar to graduate in a particular semester. It is the student's responsibility to know and meet these deadlines. The Graduate School deadlines can be found online at https://www.purdue.edu/gradschool/about/calendar/index.html. The Office of the Registrar's candidacy requirements and directives can be found online at http://www.purdue.edu/commencement/students/. Students will incur late fees for late submission of the Electronic POS to the Graduate School, declaration of candidacy beyond the

deadline, and/or listing on the Graduate School's candidate roster for the same degree more than two consecutive sessions in a row. To avoid late fees with the Graduate School, a student must adhere to the posted deadlines.

After meeting all academic requirements, the following checklist addresses some administrative details that must be addressed:

a. Complete the Checkout Sheet (available from the Student Services Office) and return keys, etc. to the Main Office. Please note that failure to complete and return this form may result in non-approval of the candidate certification and failure to graduate.
b. All research materials accumulated during a student's tenure, including the yellow copy of the laboratory notebook and appropriate electronic files and codes, should be turned in to the student's supervisor, if applicable. In the case of certain sponsored programs, the University has a legal custodial responsibility for such materials.

6.3 Ph.D. Program Time Limitations

Students who have not completed their programs by the 12th semester (16th semester for direct Ph.D. students) will be dropped from the graduate program unless the student submits a written petition to the Graduate Committee documenting unusual and extenuating circumstances and obtains permission to continue.

TABLE 6.4
DOCTORAL DEGREE REQUIREMENTS

	With MS Thesis	With Coursework MS (Direct Ph.D.)
Credits Required	90	90
Courses Required	48*	48*
Thesis Credit	42 hrs. NUCL 699 + 6 hrs NUCL 698	42 hrs. NUCL 699
Transfer Credits Maximum Total from MS degree	24	24
Final Exam	Thesis Defense	Thesis Defense
Advisory/Exam Committee Minimum Members	4	4
Advisory/Exam Committee Minimum Outside Nuclear Engineering	1	1
Common Requirements	GPA greater than or equal to 3.0, A or B Grades on all primary courses on the POS, Residence Requirements met (see Graduate School Policies and Procedures Manual)	

* Including 6 hours of approved math, computer science or other computational courses.