Academic Policies and Procedures for Graduate Work in Engineering Mechanics

This guide applies to students entering the program after August 2017. Students admitted prior to this time should continue to follow the Student guide in effect when they entered the program. They may petition the department to select features of the new curriculum.
Introduction

This bulletin details the academic policies and procedures for students working toward the M.S. and Ph.D. degrees in Engineering Mechanics. The graduate program in Engineering Mechanics is administered by the Department of Engineering Physics. The time schedules refer to those for a full-time student. Reference should also be made to Information for Graduate Students for Non-Academic Procedures; this is available from the Graduate Student Services Office, 3182 Mechanical Engineering.

Students should become familiar with the pertinent material in this bulletin and with the requirements of the Graduate School as given in the Graduate School Guidelines (https://grad.wisc.edu/acadpolicy). It is the student's responsibility to make sure that all requirements are met.

We welcome you to the University of Wisconsin-Madison and to the Department, and wish you a successful graduate career!

Admission to Graduate Study

For admission to graduate study in Engineering Mechanics, an applicant must have a bachelor's degree in engineering, mathematics, or physical science, and an undergraduate record that indicates an ability to successfully pursue graduate study. The Graduate School requires a minimum undergraduate grade point average of 3.0 on a 4.0 basis on the equivalent of the last 60 semester hours from the most recent bachelor's degree. In special cases, students with grade point averages lower than 3.0 who meet all the general requirements of the Graduate School may be considered for admission on probation. The GRE scores are required for all applicants who are not UW-Madison graduates. The TOEFL/IELTS scores are required for international applicants.

It is desirable that the student have the following courses or has taken similar courses that cover the same material before entering the program:

<table>
<thead>
<tr>
<th>Course and Semester Credits</th>
<th>Typical Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced Mathematics, 3 cr</td>
<td>Math 319 or 320 and 321</td>
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<tr>
<td>Linear Algebra and Matrices, 3 cr</td>
<td>Math 320 or 340</td>
</tr>
<tr>
<td>Mechanics of Materials, 3 cr</td>
<td>EMA 303 or 304</td>
</tr>
<tr>
<td>Dynamics, 3 cr</td>
<td>EMA 202 or Phys 311</td>
</tr>
</tbody>
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Description of course content can be accessed through the University's course guide.

A student may enter without these courses, but all must be taken prior to receipt of a graduate degree, and none can be counted toward meeting M.S. or Ph.D. requirements. With the approval of the student's adviser, the student may be permitted to meet any of these requirements by independent study followed by an examination.

Provisions for admission on probation, or as an applicant for more than one master's degree (e.g., simultaneous M.S. degrees in two departments) are given in the Graduate School website: http://grad.wisc.edu

Admission as a Special Student

The Graduate School will permit admission as a Special Student for students whose academic record is difficult to evaluate, but otherwise shows promise for graduate study. While graduate level work done as a Special Student does not earn Graduate School credit, it may still fulfill departmental course requirements. It can also be used to meet admission requirements and to correct weaknesses in the student's preparation for graduate study. After a satisfactory record as a Special Student, the student can then apply for admission as a regular graduate student. The student is advised to consult the Graduate School guidelines to determine the current policies and regulations.
Grade Policy

The Graduate School requires an average record of B or better in all 300-level or above courses taken as a graduate student regardless of whether the course counts for credit in the program. The Graduate School reviews each student’s progress every semester and will usually refuse continued enrollment after two semesters of below B-average grades unless unusual or extenuating circumstances have prevailed. The EM Program requires that courses in which grades of BC, C, or below are received cannot be counted toward a graduate degree except as follows:

1. Credits of C will be allowed provided they are balanced by twice as many credits of A or by four times as many credits of AB.
2. Credits of BC will be allowed provided they are balanced by twice as many credits of AB or by an equal number of credits of A.

Important Advice

Because of the grade requirements, it may be desirable that foreign students coming from an entirely different university system, foreign students with inadequate preparation, or American students with inadequate preparation enroll for at least the first semester in graduate study as a Special Student. (See Admission to Graduate Study.)

Advising

Each graduate student will be appointed a major professor by the chair of the Graduate Studies Committee upon entering the program. If the student is supported by a research assistantship, this will normally be the professor in charge of the research program. In other cases this will normally be a faculty member with expertise in the student's area of interest. Students desiring to change their major professor should consult with the Department Chair. Students may have a major professor outside the department if it is appropriate for the student's research area and if the professor is willing to serve in that capacity. In this case, the chair of the Graduate Studies Committee also appoints a member of the departmental faculty to serve as the student's academic (non-research) advisor.

Wait Listed Courses: In any given semester, courses may fill up quickly depending on demand. Some courses may have a wait list established through the enrollment system. Students will be notified by email if they have been given permission to enroll from the wait list. The department will assist students in enrolling for the courses they need. However, there is no guarantee that students will be allowed into a waitlisted section.

Grievance Procedure

Students who feel that they have been treated unfairly have the right to a prompt hearing of their grievance. Such complaints may involve course grades, classroom treatment, advising, various forms of harassment, or other issues. Any student or potential student may use these procedures.

Procedures for proper accounting of student grievances:

- The student should speak first with the person toward whom the grievance is directed. In most cases, grievances can be resolved at this level.
- Should a satisfactory resolution not be achieved, the student should contact the program’s Grievance Advisor to discuss the grievance. The Graduate Student Coordinator can provide students with the name of this faculty member, who facilitates problem resolution through informal channels. The Grievance Advisor is responsible for facilitating any complaints or issues of students. The Grievance Advisor first attempts to help students informally address the grievance prior to any formal complaint. Students are also encouraged to talk with their faculty...
advisors regarding concerns or difficulties if necessary. University resources for sexual harassment concerns can be found on the UW Office of Equity and Diversity website.

- If the issue is not resolved to the student’s satisfaction the student can submit the grievance to the Grievance Advisor in writing, within 60 calendar days of the alleged unfair treatment.
- On receipt of a written complaint, a faculty committee will be convened by the Grievance Advisor to manage the grievance. The program faculty committee will obtain a written response from the person toward whom the complaint is directed. The response will be shared with the person filing the grievance.
- The faculty committee will determine a decision regarding the grievance. The Grievance Advisor will report on the action taken by the committee in writing to both the student and the party toward whom the complaint was directed within 15 working days from the date the complaint was received.
- At this point, if either party (the student or the person toward whom the grievance is directed) is unsatisfied with the decision of the faculty committee, the party may file a written appeal. Either party has 10 working days to file a written appeal to the College of Engineering.

The Assistant Dean for Graduate Affairs (engr-dean-graduateaffairs@engr.wisc.edu) provides overall leadership for graduate education in the College of Engineering (CoE), and is a point of contact for graduate students who have concerns about education, mentoring, research, or other difficulties.

The Graduate School has established policies governing student conduct, academic dishonesty, and sexual and racial harassment. The Graduate School also has procedures for students wishing to appeal a grievance decision made at the college level. These policies are described in the Academic Policies and Procedures at https://grad.wisc.edu/acadpolicy/

**Limits on Credits per Term**

Full-time student status requires the student enroll for a minimum of 8 credits of course work numbered 300 and above, including research credits, each semester until the student becomes a Ph.D. dissertator. Dissertators must enroll for at least three credits. The normal maximum number of credits is 15.

Holders of research assistantships, teaching assistantships, traineeships, or fellowships are required to maintain full-time status each semester. Research assistants are expected to register for at least two credits (3 credits for dissertators) during the summer session. Teaching assistants with summer appointments need not normally be registered during the summer. Fellowship holders should consult the terms for their fellowships. A full-time student is limited to 12 credits during the summer.

**Graduate Student Seminar Requirement**

In addition to regular attendance of the Engineering Physics Colloquium (held on Tuesdays at 4:00 pm in 106 Engineering Research Building during the academic year), all Engineering Mechanics graduate students are expected to attend at least one additional research seminar or research group meeting where they may present their own research in a seminar format. First year graduate students are exempt from giving a presentation (although they may volunteer to give one), but all non-first year graduate students are expected to present on an annual basis.

The goals of the presentation requirement include:

- Provide professional development opportunities for graduate students.
- Improve the oral presentation skills of graduate students.
- Improve the ability of graduate students to "think on their feet."
• Provide an opportunity for graduate students to further understand and explain the context of their research.
• Provide a forum in which conference presentations can be practiced in front of a large technical audience.
• Improve information exchange between research groups.
• Enhance the sense of community among students in the graduate programs within the Department of Engineering Physics.

Parental Leave Policy for Graduate Student Assistants

The College of Engineering (CoE) is fully committed to providing a climate of support for women and their partners who choose to have children during their graduate studies. The goal of this CoE parental leave policy is to reduce academic and financial hardships for a) female graduate students during the late stages of their pregnancy, childbirth, and postpartum periods, and b) any graduate student who is a new parent providing care for his/her infant.

All CoE graduate students with current research, teaching, or project assistantships are eligible to request a parental leave under this policy. Upon request, expectant mothers will be provided with 12 weeks of paid accommodation time for childbirth. Other new parents (father, adoptive mother, adoptive father) will, upon request, be provided with 6 weeks of paid accommodation time. There will be no research or teaching expectations of the student during the leave.

Students should ideally notify their department (through the Department Administrator or Department Chair) six months prior to the expected birth to request the leave. Students should alert their research advisor or TA coordinator at that time as well to ensure that the ongoing research and teaching environment is safe for the expectant mother. It is recognized that each case will be unique in terms of the timing of the pregnancy or adoption relative to the academic calendar, and that creative and supportive solutions will be required on the part of advisors, chairs, TA coordinators, etc.

The leave will ordinarily begin at the time of birth, but other proposals will be considered. Departments – both advisors and chairs – are expected to provide flexibility in working out the details of the leave and to adjust the timeline of the leave as needed to accommodate any unexpected medical issues that arise during pregnancy (e.g. doctor-ordered bed rest).

All academic requirement deadlines (e.g., qualifying exams) will be extended for the student requesting the leave, consistent with department academic timelines.

Graduate Policy-Related Web Sites

The Graduate School web site (http://grad.wisc.edu) has extensive information concerning policies and procedures for graduate students. You are responsible for consulting it and abiding by it.

Other useful web sites are:

Engineering Physics Department [http://www.engr.wisc.edu/department/engineering-physics]

College of Engineering [http://www.engr.wisc.edu]
Master of Science Degree

Requirements for the Master of Science in Engineering Mechanics

1. The student should arrange with his or her advisor a coherent program of study as follows:

The program of study must include a minimum of 30 credits of graduate level technical course work such that at least 15 credits are in 500 level or above EMA courses with at least 6 of these 15 credits being in 700 level or above EMA courses. In addition, the combined EMA course content of the student's undergraduate and graduate program of study must include at least 24 credits of 500 level or above of mechanics course work.

EMA 601 Special Topics courses may only be counted as 700-level if designated as such by the instructor. The following courses are excluded from the 500 and 700 level or above requirements: EMA 690, 599, 790, 890, 990, or 999. Departmental approval is required for the use of more than 6 credits of Independent Study.

Up to 3 seminar credits may be used to satisfy these requirements. No more than one seminar credit can be taken in any given semester.

A course that is to count toward the M.S. degree must be passed with a grade of A, AB, or B. Note that the Graduate School requires a GPA of 3.0 for all courses taken at the 300 level or above, even if they are not used to count towards the M.S. degree.

2. At least 15 credits must be at the graduate level. This is defined as any courses 600-level and above (including 790) or from EMA 508, 518, 519, 522, 523, 540, 541, 547, 548, 570 or any course defined as “Grad 50%” in Math, Physics, Computer Science, or any other engineering department, except EPD. “Grad 50%” courses are designated as such in the UW-Madison Guide, guide.wisc.edu.

3. Satisfy all Graduate School requirements, including grade point average requirements.

Transfer of Credits
Students may transfer up to 6 credits of graduate work taken at another institution if they meet departmental M.S. requirements. Students with a BS degree in Engineering Mechanics or other engineering field at UW-Madison may also use 7 credits of their undergraduate work towards their MS. Students with a BS degree from an ABET accredited engineering discipline at another institution may request permission from the EP Chair to use 7 credits of undergraduate work towards their MS degree.

Explanation of Research and Thesis Credits
EMA 790 is for research that is expected to lead to a M.S. thesis, EMA 890 is for research where the student has not yet become a dissertator and the research will not be used for a M.S. thesis, and EMA 990 is for Ph.D. dissertation research where the student is a dissertator. Credits taken per semester are variable. Students should discuss the appropriate number of credits for a specific semester with their advisor.

Master’s Thesis
A thesis is not required for a Master's degree in Engineering Mechanics. If a Master's thesis is submitted, a maximum of 12 credits of EMA 790 may be granted for the thesis. Credit for Master's research (EMA 790) will be granted toward meeting the M.S. requirements only when a formal M.S. thesis is submitted. A thesis Oral Defense is required.
EMA 690, Master’s Research, is available for graduate students to receive credit for Master’s level research not expected to lead to a Master’s thesis. A maximum of 12 credits of EMA 690 may be counted toward meeting the M.S. requirements.

**Master’s Thesis Oral Examination**
Candidates must pass an oral exam administered by three faculty members, selected by the student’s advisor. The use of thesis credits (EMA 690 or 790) as part of the 30 credit M.S. requirement always requires a defense, and the oral exam will be on the thesis. Typically, the student presents an overview of their thesis/research and then the examiners ask questions in closed session.

**Criteria for Satisfactory Progress**
Students with a Bachelor of Science in Engineering Mechanics or equivalent are typically expected to complete the Master of Science in 3 semesters. Students with non-EM backgrounds will typically be permitted 4 semesters to complete their Master's if more than 27 credits are required.

**Application Procedures for the Master's Degree**

> Below is a summary of some of the Graduate School requirements. This is not a complete list. Please review the Graduate School Catalog and the Graduate School Academic Policies and Procedures for a complete list, or contact the Graduate School.

To receive a master’s degree, contact the Graduate Student Services Office, 3182 Mechanical Engineering, the beginning of the semester in which you intend to graduate. Have your advisor check that you have met department requirements, then Student Services will check that you have met Graduate School's requirements and will request a warrant on your behalf from the Graduate School. You need to be enrolled for a minimum of two graduate-level credits (300 or above) for a grade (audits and pass/fail do not satisfy this requirement) during the semester in which you intend to graduate. For more information and for deadlines see Expecting your Master’s Degree? Procedures to Help, found at the website http://grad.wisc.edu/currentstudents/degree/.

If you have a prior Master's degree from this University, or are expecting to complete two separate degrees during the same semester, you must submit along with your degree application a letter from each department that includes an official (signed by advisor or Department Chair) list of courses used for each degree. Your warrant application is not complete until the two lists are received.

You must have a graduate GPA of at least 3.0/4.0 and no incomplete or progress grades on your record. (Progress grades in EMA 890 are allowed.).

A signed Warrant is a document needed to graduate. The Warrant is issued by the Graduate School for one semester only. The Warrant is signed by your academic advisor and the Department Chair indicating that all degree requirements have been met. Warrants can be issued after all other incomplete and progress grades are cleared.

If the Department has signed and returned your Warrant to the Graduate School, and you subsequently receive an incomplete or progress grade, you will graduate during the semester in which your grade is cleared.
Doctor of Philosophy Degree

Requirements
The Ph.D. program requires a minimum of 72 credits beyond the B.S. degree. Normally, 18 - 24 of these are research thesis credits (EMA 890 and EMA 990). At least 26 credits must be at the graduate level, as defined above in the MS requirements. The major emphasis of the student's Ph.D. program is the Ph.D. thesis.

Major Field of Study
The major field of study is to be arranged with the major professor. In addition to completion of the M.S. requirements, Ph.D. students are required to successfully complete at least 2 additional EMA courses numbered 600 or above and 4 additional courses numbered 700 level or above. The 700 level or above courses must include at least 1 EMA course, while the remainder may be from EMA or the list of selected courses provided below (other courses may be allowed with departmental approval).

Selected 700 level courses:
- **CS 714 Methods of Computational Mathematics I**
  Pre-reqs: Comp sci 302, 412; Math 322, 340, 521; or equiv; or cons inst
- **CS 715 Methods of Computational Mathematics II**
  Pre-reqs: Comp sci 302, 412; Math 322, 340, 521, 714; pr equiv; or cons inst
- **CS 733 Computational Methods for Large Sparse Systems**
  Pre-reqs: Comp sci 367 & ECE 334, or Comp Sci 367, 412, & Math 340; or cons inst
- **CEE 730 Engineering Properties of Soils**
  Pre-reqs: Civ. Engr. 330
- **CEE 735 Soil Dynamics**
  Pre-reqs: Civ. Engr/EMA 530, EMA 545 or cons inst
- **CEE 740 Matrix Methods of Structural Analysis**
- **ECE 717 Linear Systems**
  Pre-reqs: Math 340 or cons inst
- **ECE 719 Optimal Systems**
  Pre-reqs: ECE 334 or cons inst
- **ECE 732 Advanced Digital Signal Processing**
  Pre-reqs: ECE 431 & 331, or cons inst
- **ECE 777 Nonlinear Dynamics, Bifurcations and Chaos**
  Pre-reqs: Cons inst
- **Math 703 Methods of Applied Mathematics I**
  Pre-reqs: Math 340, 521-522, and 623 (or 623 concur), or equiv. Not open to students with cr. for Math 701/702
- **Math 704 Methods of Applied Mathematics 2**
  Pre-reqs: Math 340, 521-522, and 623 (or 623 concur), or equiv. Not open to students with cr. for Math 701/702
- **Math 705 Mathematical Fluid Dynamics**
  Pre-reqs: Cons inst
- **MS&E 705/GLE 705 Advanced Rock Mechanics**
  Pre-reqs: MS&E 474, 475, or equiv, or cons inst
- **MS&E 748 Structural Analysis of Materials**
  Pre-reqs: MS&E 448
- **MS&E 750 Imperfections and Mechanical Properties**
  Pre-reqs: Cons Inst
- **MS&E 760 Molecular Dynamics and Monte Carlo Simulations in Material Science**
  Pre-reqs: Grad st. or cons inst
- **MS&E 770 Methods of Surface and Interface Characterization**
  Pre-reqs: MS&E 570 or cons inst
ME 740 Advanced Vibrations  
Pre-reqs: ME 440 or cons inst

ME 758 Solid Modeling  
Pre-reqs: Comp sci 367 or equiv, Math 340 or equiv, or cons inst

Phys 711 Theoretical Physics - Dynamics  
Pre-reqs: Cons inst

Phys 715 Statistical Mechanics  
Pre-reqs: Phys 711, 531 & 415, or equiv

Phys 721 Theoretical Physics - Electrodynamics  
Pre-reqs: Phys 322 or equiv

Phys 722 Advanced Classical Theory  
Pre-reqs: Phys 721

Phys 731 Quantum Mechanics I  
Pre-reqs: Phys 449 or 531, or equiv

Phys 732 Quantum Mechanics II  
Phys 721 & 731)

Phys 751 Advanced Solid State Physics  
Pre-reqs: Phys 731 & 551, or equiv

Phys 801 Nanostructures in Science & Technology  
Pre-reqs: Cons inst

EMA 601 Special Topics courses may only be counted as 700-level if designated as such by the instructor. The following courses are excluded from the 600 and 700 level or above requirements: EMA 690, 699, 790, 890, 990, or 999.

For students entering the department with an M.S. degree, 3 of the 4 700-level courses beyond the M.S. must be EMA courses.

**Minor Field of Study**
The minor field of study must be chosen in consultation with the major professor. The Ph.D. Minor Agreement Form must be on file with the Department of Engineering Physics halfway through the minor program. Forms are available from Student Services, room 2107 ME.

There are two minor options available:

**Minor Option A**
Students minor in a single department and satisfy the minor requirements of that department.

**Minor Option B (Distributed Minor)**
This option requires a minimum of 10 credits in two or more departments outside the major, in related courses selected for their relevance to a particular area of concentration. The following rules apply:

1. Courses typically included on or within the scope of the EMA Qualifying Exam shall not be considered acceptable for the Ph.D. Minor Option B.

2. At least 6 credits must be taken in courses listed in the UW-Madison Guide as "Grad 50%" courses.
Ph.D. Qualifying Examination

Qualifying Exam Scheduling
The examination is given each fall and spring semester within the first week of classes. All eligible students will receive notice each time the exam is given. It is the student’s responsibility to consult with his or her advisor for approval to take the exam at that time and the specific exams to be taken.

The exam must be first taken no later than completion of the M.S. requirements, or the beginning of the fifth semester of graduate study, whichever comes first. Students entering the program with a Master's degree in EM or NEEP from another institution, and taking the qualifying exam in that same major, should take the exam by the beginning of their third semester.

Requirements for Passing the Qualifying Exam
Students are given two chances to pass the set of qualifying exams. All exams are to be graded on a pass/fail basis. If an individual exam is failed, it may be taken a second time. An exam that is passed does not have to be repeated, independent of student performance on the other exams.

Subject Area Options for the Qualifying Exam
The student with their advisor’s approval will sign up to take 3 three-hour closed book written exams from a possible list of 7 exams plus an oral exam.

These 7 written exams are planned to be in the following topic areas (resources detailed on pages 8 & 9):
- Mathematics (Math 319, 321 and 340 or similar topics in EMA/EP 547)
- Classical Physics (Physics 311 and 322)
- Modern Physics (Physics 241 and NE 305)
- Elementary Mechanics and Materials (EMA 202, 303 and MS&E 350)
- Engineering Mechanics (EMA 506, 542, 545)
- Momentum and Heat Transfer (ChE 320 or similar topics in ME 363, 364)
- Reactor Analysis and Radiation Protection (NE 405, 408, 427)

Exceptions to the Qualifying Exam Policy
In a few cases it may be unreasonable to retake the exam the next time it is given; in this case the student should petition the Department for permission to defer the reexamination. Such a petition should be by letter and must be received by the Department Chair within one month after learning the outcome of the first examination. If extenuating circumstances should arise thereafter and before the next exam, the student can petition the Department for a deferral.

On rare occasion, extenuating circumstances, such as a medical condition, may arise that affects a student's ability to pass the qualifying examination in two attempts. If a student fails the qualifying examination twice, and after reviewing the graded second exam and consultation with his or her advisor, the student feels that extenuating circumstance hindered his or her performance, he or she can petition the Department for a third attempt. Such a petition should be by letter and must be received by the Department Chair within one month after learning the outcome of the second examination. The Department faculty will review the petition and decide whether the student will be granted a third opportunity to pass the exam.

Description of the Oral Qualifying Exam
An oral exam is required for all students taking the qualifying exam and will be graded on a pass/fail basis. The oral exams are scheduled immediately after the written exams. The subject matter of the questions is based on the written exams chosen by the student and his or her advisor (i.e., engineering mechanics, plasma physics or nuclear engineering). The oral exam committee consists of 3 faculty
members including the student's advisor, one additional member from the student's same research area, and one member from a different research area. The oral exam lasts approximately one hour.

**Description of Qualifying Examination Written Exams**
Listed below are topics, courses and texts representative of material to be covered on the respective examinations. Prior exams (without solutions) are available in the Department office.

**A. Engineering Mathematics** (3 hours, typically 4 out of 6 questions):
- Ordinary Differential Equations (Math 319)
  - Boyce & DiPrima, *Elementary Differential Equations & Boundary Value Problems*
- Applied Mathematical Analysis (Math 321)
  - Greenberg, *Advanced Engineering Mathematics*
  - Hildebrand, *Advanced Calculus for Applications*
- Linear Algebra (Math 340)
  - Lay, *Linear Algebra and Its Applications*

**B. Classical Physics** (3 hours, typically 4 out of 6 questions):
- Mechanics (Physics 311)
  - Marion and Thornton, *Classical Dynamics of Particles & Systems*
- Intermediate Electricity and Magnetism (Physics 322)
  - Griffiths, *Introduction to Electrodynamics*
  - Lorrain & Corson, *Electromagnetic Fields and Waves*

**C. Modern Physics** (3 hours, typically 4 out of 6 questions):
- Fundamentals of Modern Physics (Physics 241)
  - Tipler, *Elementary Modern Physics*
- Atomic and Nuclear Physics (NE 305)
  - Krane, *Introductory Nuclear Physics*

**D. Elementary Mechanics and Materials** (3 hours, typically 4 out of 6 questions):
- Elementary Dynamics (EMA 202)
- Mechanics of Materials (EMA 303)
  - Gere, *Mechanics of Materials*
- Fundamentals of Materials Science (MSAE 350 or 351)
  - Van Vlack, *Elements of Materials Science and Engineering*
  - Callister, *Materials Science and Engineering, An Introduction*

**E. Engineering Mechanics** (3 hours, typically 4 out of 6 questions):
- Advanced Mechanics of Materials (EMA 506)
  - Cook & Young, *Advanced Mechanics of Materials*
- Advanced Dynamics (EMA 542)
  - Ginsberg, *Advanced Engineering Dynamics*
- Mechanical Vibrations (EMA 545)
  - Inman, *Engineering Vibration*
  - Thomson, *Theory of Vibrations with Applications*

**F. Momentum and Heat Transfer** (3 hours, typically 4 out of 6 questions):
- Transport Phenomena (CBE 320)
  - Bird, Stewart and Lightfoot, *Transport Phenomena***OR***
- Elementary Fluid Dynamics (ME 363)
  - Fox & McDonald, *Introduction to Fluid Mechanics*
G. Reactor Analysis and Radiation Protection (3 hours, typically 4 out of 6 questions):
   Nuclear Reactor Theory (NE 405)
   Duderstadt and Hamilton, *Nuclear Reactor Analysis*
   Ionizing Radiation (NE 408)
   Lamarch, *Introduction to Nuclear Engineering*
   Nuclear Instrumentation (NE 427)
   Knoll, *Radiation Detection and Measurement*

**Doctoral Plan of Study**

The Department will formally accept the student as a candidate for the Ph.D. after the passage of the Qualifying Examination and upon approval of a doctoral plan of study showing the intended courses of study. The format to be used for this application is given in Appendix A. The Department staff will review the student's entire academic history. It will act on the application based on its collective knowledge of the student's performance in and out of formal coursework. Factors which will be considered include: (a) whether the student would likely profit from further, formal academic study, and (b) whether the student meets the high academic standards and the standards of intellectual integrity expected of a Ph.D. holder from the University of Wisconsin. This is a decision of the Department as a whole, and, while the advice of the student's major professor is solicited, the major professor does not make the decision alone. The student is expected to discuss the doctoral plan in detail with and receive approval of their major professor in order to develop a coherent academic plan of doctoral study.

Approval of the student's proposed course of study will automatically indicate acceptance by the Department as a Ph.D. candidate, and the student will be advised in writing. Attention is called to the fact that formal acceptance as a candidate, rather than passage of the Qualifying Examination, ordinarily constitutes the major step in progress towards the Ph.D.

**To assure that a coherent program is planned, the student must submit the Doctoral Plan of Study one month before the end of the semester following the one in which the Qualifying Exam is passed.**

If a distributed Technical Minor is proposed, acceptance as a Ph.D. candidate constitutes Departmental approval of that Technical Minor.

If it becomes necessary to modify the student's proposed course of study after it has been approved, it is the student's responsibility to bring the matter to the attention of the faculty in writing.

**Note:** The Graduate School considers an applicant formally admitted to candidacy for the Ph.D. degree when the student has:
(a) Passed the comprehensive Preliminary Examination in the major field,
(b) Obtained approval of the proposed technical minor requirement, and
(c) Presented the title or special field of the proposed thesis, approved by the major professor.

**English Competency for International Students**

It is essential that all students be fluent in spoken and written English, the main international language of science and technology. Students are therefore required to attain a level of competence in English as defined below before the Preliminary Examination can be taken.
1. In all cases the Department will decide whether a student has attained the level of competence in English. A student who satisfies the Department requirement of competence in English should be able, without assistance, to write a Ph.D. thesis in simple, correct and unambiguous English.

2. Unless otherwise excused in writing by the Department Chair, all international Ph.D. graduate students (including M.S. students intending to pursue the Ph.D.) are required during their first semester of graduate study to either
   a. take the Ph.D. English Language Proficiency Examination (ELPE) conducted by the Department of English under the auspices of the Program in English as a Second Language (PESL), or
   b. register for instruction in English for international students (PESL) and subsequently take the ELPE.

3. A student who passes the ELPE with the grade of Competence or Advanced Competence will be deemed by the Department to have satisfied the language requirement.

4. The language requirement must be satisfied prior to taking the Preliminary Examination.

The ELPE comprises a 75 minute test of grammar, vocabulary and reading comprehension, and a 45 minute essay on a topic assigned from a standard introductory textbook in the student's major field brought to the examination by the student; the student should ask the Department Office for a list of acceptable textbooks.

The PESL offers courses, tutorial assistance, writing and listening laboratories, and placement examinations.

**Ph.D. Preliminary Examination**

After acceptance of the student's Doctoral Plan of Study, the student must take an oral preliminary examination. Students are expected to pass the Ph.D. Preliminary Examination no later than the end of the third year of graduate studies, or by the end of the second regular semester following the one in which the Ph.D. Qualifying Examination was passed, whichever is later. They are required to take the Preliminary Examination within four years of passing the Ph.D. Qualifying Examination.

In preparation for this examination, the student shall submit a written thesis proposal containing a discussion of the thesis problem, a survey of pertinent literature, an evaluation of the importance of the problem, an outline of the proposed method of solving the problem, drawings of any equipment to be constructed, a cost estimate, and any preliminary results obtained. The student will then defend the thesis proposal in an oral Preliminary Examination. The Examination Committee will normally be the same as selected for the Final Oral Examination. It will include at least one member from outside the departmental faculty (EP), and it will be chosen to make a critical evaluation of the proposed thesis. The candidate must apply for a warrant from the Graduate School through the Graduate Student Services Office, 3182 Mechanical Engineering, at least three weeks prior to the exam.

Should the candidate not pass the preliminary examination, the student is granted a second opportunity to be held within six months of the first examination.

**Dissertator Status**

All Ph.D. candidates who passed their Preliminary Examination and have completed the major as well as the minor requirements can be designated dissertators. Dissertators may register for as few as three credits. (The dissertator fee is substantially lower than the usual cost of the 8-credit load.) Dissertators normally enroll in thesis and research courses (EMA 990), but with the approval of their advisors are permitted to substitute three credits of any other graduate level courses; additional credits are permitted at the same dissertator rate per-credit. Dissertators should register each semester until the Ph.D. thesis is
filed. If the student fails to do so, a Ph.D. Dissertation and Degree Completion Fee equal to 12 times the current dissertator per-credit rate is required.

**Final Oral Examination**

An oral examination on the findings of the Ph.D. research is required at the end of the thesis work. This thesis defense is made before a committee of five current faculty members, who have had access to a copy of the thesis for at least 10 days prior to the oral examination. It is advisable to choose this committee as close to that of the Preliminary Examination Committee as practical. At least 4 of the committee members must be members of the UW-Madison graduate faculty. At least 1 member of the committee must be from outside the student’s major program. One of the members of the committee may be from outside the UW-Madison, subject to approval by the EP Department executive committee. (Consult the Graduate School’s Academic Policies and Procedures for more details.) The candidate must apply for a warrant from the Graduate School through the Graduate Student Services Office, 3182 Mechanical Engineering, at least three weeks prior to the exam.

This examination shall be publicly announced at least one week prior to the examination date. Faculty and students are invited to attend.

**Thesis**

The thesis must be the candidate's own work; it reports on the original research carried out by the student for the Ph.D. degree. It may be the result of research enterprises in which others have collaborated, but in such cases the candidate is required to present a substantial portion which represents the candidate's own contribution.

The total cost and preparation of the thesis is the responsibility of the student. Detailed instructions for thesis preparation are available from the Graduate School Office in Bascom Hall, and on the Graduate School webpage: http://www.grad.wisc.edu.

**Library Copy:** The submitted thesis must meet the specifications of the Graduate School. Guidelines are available from the Graduate School in Bascom Hall.

**Department and Major Professor Copies:** You should provide copies of the thesis to the department and your advisor and they should be bound in durable black Buckram binding with hard cover (Grimm’s book binding can do this or check with the library for this service.) The student's name, degree and year of graduation should be printed in bold gold letters on the book spine. The front and back covers should remain blank.

**Industrial/Research Sponsor Copy:** The major professor will determine if additional copies are needed. He/she will also advise the student as to the specifications of the copy.

**Criteria for Satisfactory Progress**

It is important that graduate students make satisfactory progress in their program of study. One way of measuring the student's progress is his or her schedule for completing various requirements for the Ph.D. degree. The relevant deadlines are listed below. **Students not meeting these deadlines are considered to not be making satisfactory progress and may become ineligible for financial support and/or be dropped from the program.**

1. The Qualifying Examination should be first taken no later than completion of the MS requirements, or the beginning of the fifth semester of graduate study, whichever comes first. Students entering the program with a Master's degree in EM, EP or NEEP, and taking the qualifying exam in that same major, must take the exam by the beginning of their third semester.

2. Students are expected to submit the Doctoral Plan of Study one month before the end of the semester.
following the one in which the Qualifying Exam is passed.

3. International students are required to have demonstrated competency in English prior to taking the Preliminary Exam.

4. Students are expected to schedule and pass the Ph.D. Preliminary Examination no later than the end of the third year of graduate studies, or by the end of the second regular semester following the one in which the Ph.D. Qualifying Examination is passed, whichever is later. A candidate who fails to take their Preliminary Exam within four years of passing their Qualifying Exam must retake the Qualifying Exam unless there are extenuating circumstances (such as medical) and the Department faculty approves a delay. Students in this situation should meet with their advisor and develop a plan for taking the preliminary exam, subject to approval by the Department faculty.

5. A candidate who fails to take the Final Oral Examination and deposit the dissertation in the Memorial Library within 5 years after passing the Preliminary Examination must take another Preliminary Examination. See the Graduate School's policies on preliminary examinations and time limits for additional information.

**Minor in Engineering Mechanics**

For students in other departments seeking a minor in Engineering Mechanics, the following requirements apply:

1. A student who has earned an M.S. degree in Engineering Mechanics will be considered to have fulfilled the minor requirements.

2. A minimum of 10 credits in EMA courses, including 3 credits in 700 level or above courses. In addition,
   a. All courses used for the minor must be 300 level or above and taken after the bachelor’s degree.
   b. Ordinarily only one course (maximum of 3 credits) of independent study is allowed (599, 690, 799, 999).
   c. Research and thesis courses may not be used for the minor.
   d. No more than 5 credits completed 5 or more years prior to admission to the Ph.D. major may be used.
   e. Courses taken 10 or more years ago may not be used.
   f. Courses taken pass/fail or for audit may not be used.
   g. Courses with grades of “S” given in courses graded on a credit/no credit basis are acceptable.

3. A GPA of 3.0 must be maintained for the minor.

4. A maximum of 6 credits may be transferred from other institutions to satisfy the minor requirements.

5. The minor program must be approved by the department chair.
Departmental Office Staff

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Office</th>
<th>Phone</th>
<th>E-mail address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Douglass Henderson</td>
<td>Chair</td>
<td>153 ERB</td>
<td>263-0808</td>
<td><a href="mailto:dlhender@wisc.edu">dlhender@wisc.edu</a></td>
</tr>
<tr>
<td>Dina Christenson</td>
<td>Human Resources</td>
<td>145 ERB</td>
<td>263-5966</td>
<td><a href="mailto:dina.christenson@wisc.edu">dina.christenson@wisc.edu</a></td>
</tr>
<tr>
<td>Nancy Griego</td>
<td>Financial Records</td>
<td>107 ERB</td>
<td>263-2352</td>
<td><a href="mailto:nancy.griego@wisc.edu">nancy.griego@wisc.edu</a></td>
</tr>
<tr>
<td>Tim Jensen</td>
<td>Communications Specialist</td>
<td>144 ERB</td>
<td>265-5092</td>
<td><a href="mailto:timjensen@wisc.edu">timjensen@wisc.edu</a></td>
</tr>
<tr>
<td>Dennis Manthey</td>
<td>Dept. Administrator</td>
<td>146 ERB</td>
<td>263-1647</td>
<td><a href="mailto:dennis.manthey@wisc.edu">dennis.manthey@wisc.edu</a></td>
</tr>
<tr>
<td>Jesse Prochaska</td>
<td>Accountant</td>
<td>109 ERB</td>
<td>890-3580</td>
<td><a href="mailto:jjprocha@wisc.edu">jjprocha@wisc.edu</a></td>
</tr>
<tr>
<td>Kathy Wegner</td>
<td>Financial Specialist</td>
<td>503 ERB</td>
<td>263-8142</td>
<td><a href="mailto:wegner@engr.wisc.edu">wegner@engr.wisc.edu</a></td>
</tr>
</tbody>
</table>

Graduate Student Services Office

The College Graduate Student Services Office is located in 3182 Mechanical Engineering. Questions about the application process can be directed to emgradadmission@engr.wisc.edu. For assistance with Graduate School requirements and warrant requests, contact Sara Hladilek, shladilek@wisc.edu, 262-8617.

Reactor Lab Staff

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Office</th>
<th>Phone</th>
<th>E-mail address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robert Agasie</td>
<td>Reactor Director</td>
<td>1209 ME</td>
<td>262-3392</td>
<td><a href="mailto:agasie@engr.wisc.edu">agasie@engr.wisc.edu</a></td>
</tr>
<tr>
<td>Corey Edwards</td>
<td>Reactor Supervisor</td>
<td>1214 ME</td>
<td>890-1924</td>
<td><a href="mailto:csedwards@wisc.edu">csedwards@wisc.edu</a></td>
</tr>
</tbody>
</table>

Engineering Physics Faculty

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Office</th>
<th>Phone</th>
<th>E-mail address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matthew S. Allen</td>
<td>Associate Professor</td>
<td>525 ERB</td>
<td>890-1619</td>
<td><a href="mailto:matt.allen@wisc.edu">matt.allen@wisc.edu</a></td>
</tr>
<tr>
<td>Todd R. Allen</td>
<td>Professor</td>
<td>2104 ECB</td>
<td>265-4083</td>
<td><a href="mailto:todd.allen@wisc.edu">todd.allen@wisc.edu</a></td>
</tr>
<tr>
<td>James P. Blanchard</td>
<td>Professor</td>
<td>2620h EH</td>
<td>263-0391</td>
<td><a href="mailto:jake.blanchard@wisc.edu">jake.blanchard@wisc.edu</a></td>
</tr>
<tr>
<td>Riccardo Bonazza</td>
<td>Professor</td>
<td>537 ERB</td>
<td>265-2337</td>
<td><a href="mailto:riccardo.bonazza@wisc.edu">riccardo.bonazza@wisc.edu</a></td>
</tr>
<tr>
<td>Adrien Couet</td>
<td>Assistant Professor</td>
<td>703 ERB</td>
<td>265-7955</td>
<td><a href="mailto:couet@wisc.edu">couet@wisc.edu</a></td>
</tr>
<tr>
<td>Wendy Crone</td>
<td>Professor</td>
<td>543 ERB</td>
<td>262-8384</td>
<td><a href="mailto:wendy.crone@wisc.edu">wendy.crone@wisc.edu</a></td>
</tr>
<tr>
<td>Raymond J. Fonck</td>
<td>Professor</td>
<td>333 ERB</td>
<td>263-7799</td>
<td><a href="mailto:fonck@engr.wisc.edu">fonck@engr.wisc.edu</a></td>
</tr>
<tr>
<td>Chris C. Hegna</td>
<td>Professor</td>
<td>521 ERB</td>
<td>263-0810</td>
<td><a href="mailto:hegna@engr.wisc.edu">hegna@engr.wisc.edu</a></td>
</tr>
<tr>
<td>Douglass Henderson</td>
<td>Professor</td>
<td>153 ERB</td>
<td>263-0808</td>
<td><a href="mailto:dlhender@wisc.edu">dlhender@wisc.edu</a></td>
</tr>
<tr>
<td>Roderick S. Lakes</td>
<td>Professor</td>
<td>541 ERB</td>
<td>265-8697</td>
<td><a href="mailto:rlakes@wisc.edu">rlakes@wisc.edu</a></td>
</tr>
<tr>
<td>John Murphy</td>
<td>Faculty Associate</td>
<td>147 ERB</td>
<td>265-4186</td>
<td><a href="mailto:john.murphy@wisc.edu">john.murphy@wisc.edu</a></td>
</tr>
<tr>
<td>Sonny Nimityongskul</td>
<td>Faculty Associate</td>
<td>509 ERB</td>
<td></td>
<td><a href="mailto:apnimityongs@wisc.edu">apnimityongs@wisc.edu</a></td>
</tr>
<tr>
<td>Jacob Notbohm</td>
<td>Assistant Professor</td>
<td>533 ERB</td>
<td>890-0030</td>
<td><a href="mailto:jacob.notbohm@wisc.edu">jacob.notbohm@wisc.edu</a></td>
</tr>
<tr>
<td>Raluca Scarlat</td>
<td>Assistant Professor</td>
<td>931 ERB</td>
<td>890-4256</td>
<td><a href="mailto:raluca.scarlat@wisc.edu">raluca.scarlat@wisc.edu</a></td>
</tr>
<tr>
<td>Oliver Schmitz</td>
<td>Associate Professor</td>
<td>341 ERB</td>
<td>263-1547</td>
<td><a href="mailto:oschmitz@wisc.edu">oschmitz@wisc.edu</a></td>
</tr>
<tr>
<td>Leslie Smith</td>
<td>Professor (also Math)</td>
<td>825 VV</td>
<td>263-3057</td>
<td><a href="mailto:lsmith@math.wisc.edu">lsmith@math.wisc.edu</a></td>
</tr>
<tr>
<td>Carl R. Sovinec</td>
<td>Professor</td>
<td>519 ERB</td>
<td>263-5525</td>
<td><a href="mailto:csovinec@engr.wisc.edu">csovinec@engr.wisc.edu</a></td>
</tr>
<tr>
<td>Ramathasan Thevamaran</td>
<td>Assistant Professor</td>
<td>539 ERB</td>
<td>262-5724</td>
<td><a href="mailto:thevamaran@wisc.edu">thevamaran@wisc.edu</a></td>
</tr>
<tr>
<td>Fabian Waleffe</td>
<td>Professor (also Math)</td>
<td>819 VV</td>
<td>262-3269</td>
<td><a href="mailto:waleffe@math.wisc.edu">waleffe@math.wisc.edu</a></td>
</tr>
<tr>
<td>Paul Wilson</td>
<td>Professor</td>
<td>419 ERB</td>
<td>263-0807</td>
<td><a href="mailto:paul.wilson@wisc.edu">paul.wilson@wisc.edu</a></td>
</tr>
<tr>
<td>Robert J. Witt</td>
<td>Associate Professor</td>
<td>531 ERB</td>
<td>263-2760</td>
<td><a href="mailto:robert.witt@wisc.edu">robert.witt@wisc.edu</a></td>
</tr>
</tbody>
</table>
APPENDIX A

Engineering Mechanics and Nuclear Engineering and Engineering Physics Master’s Timeline

Steps towards your degree
- Coursework MS Option:
  o Begin coursework
  o Complete coursework
  o Have advisor check progress toward Department degree requirements
  o Request MS warrant several weeks before oral exam and/or graduation
  o Take oral exam → NEEP Only
  o MS Degree Awarded

- Thesis MS Option
  o Begin coursework
  o Identify research advisor and topic
    ▪ Sign up for Research EMA 790 or NE 790
  o Complete research and write thesis
  o Have advisor check progress toward Department degree requirements
  o Request MS warrant several weeks before oral exam
  o Thesis Oral Defense
  o MS Degree awarded

______________________________
Engineering Mechanics and Nuclear Engineering PhD Program Timeline

Steps towards your degree
- Identify research advisor before arriving on campus or during your first semester
- Begin coursework and start research (EMA 890 or NE 890)
- Take Qualifying Exam (third or fourth semester)
- Finish MS coursework
  - Request MS warrant if an MS is desired
- Submit Doctoral Plan (semester after passing Qualifying Exam)
- Minor Requirements Completed (another 1-3 semesters)
- Write Prelim
- Request Prelim Warrant several weeks before Prelim Exam
- Take Prelim Exam (submit signed warrant to Graduate School after coursework is completed)
- Dissertator (EMA 990 or NE 990)
- Finish Thesis
- Have advisor check progress toward Department degree requirements
- Request Final Warrant several weeks before Prelim Exam
  - Defend Thesis
- Warrant signed
- Thesis must be completed within 5 years of Prelim Exam
  - Make Corrections
  - Final Appointment at Graduate School (turn in final warrant, etc.)
  - Deposit bound thesis copy to Department and Advisor
  - PhD Degree awarded
APPENDIX B: SAMPLE FORMAT

STATEMENT OF DOCTORAL PLAN

Date: 
To: Douglass Henderson, Department Chair 
From: (Name) 
Subject: EM Doctoral Plan 

I request approval of the following doctoral plan and formal acceptance as a Ph.D. candidate in the EM Ph.D. program.

A. COURSES IN MAJOR FIELD OF STUDY (already taken or to be taken)

<table>
<thead>
<tr>
<th>Course #</th>
<th>Course Title</th>
<th>Credits</th>
<th>Date</th>
<th>Grade</th>
<th>Part of MS?</th>
</tr>
</thead>
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Total Credits

B. TECHNICAL MINOR

<table>
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<tr>
<th>Course #</th>
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<th>Date</th>
<th>Grade</th>
<th>Part of MS?</th>
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I chose minor option A (or B - delete one); see courses listed above. Prof. ___________ of the _______ Department has approved this minor on ______ (date) _____.

C. PROPOSED AREA OF THESIS RESEARCH

I propose to do my thesis research on _________________________________. Professor ___________ will be my thesis advisor.

D. EXAMINING COMMITTEES

My advisor, _______________________________ recommends the following five staff people constitute my Preliminary Examination Committee and, if practical, my Final Oral Committee:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

I have obtained the consent of each of the faculty members listed to serve on these committees. At least one of these members is from outside the EP Department.
E. MASTER'S THESIS
I (did) (did not) perform a Master's thesis. (If applicable, give title, major professor, institution.)

F. Ph.D. QUALIFYING EXAM
I passed the EMA Ph.D. qualifying exam on ____________.

G. ENGLISH LANGUAGE PROFICIENCY EXAM
(Applicable only to International Students)
I have passed the English Language Proficiency Exam on (date) with a grade of ________.

H. DEGREES HELD
I have previously received the following degree(s):

I. PERTINENT GRADUATE COURSES
I have taken the following graduate courses at ______________________ which are particularly significant in my present plans:

<table>
<thead>
<tr>
<th>Course No. and Title</th>
<th>Credits</th>
<th>Date</th>
<th>Grade</th>
</tr>
</thead>
</table>

J. PERTINENT UNDERGRADUATE COURSES
I have taken the following undergraduate courses at ______________________ which are particularly significant in my present plans:

<table>
<thead>
<tr>
<th>Course No. and Title</th>
<th>Credits</th>
<th>Date</th>
<th>Grade</th>
</tr>
</thead>
</table>

The following courses were taken as a graduate student at UW to satisfy admission requirements:

<table>
<thead>
<tr>
<th>Course No. and Title</th>
<th>Credits</th>
<th>Date</th>
<th>Grade</th>
</tr>
</thead>
</table>

Respectfully submitted:

(Name)

I have checked and approve this statement. Approved by the Department

(Major Professor) (signature of department chair) (date)