

GRADUATE PROGRAM HANDBOOK

Department of Mechanical and Nuclear Engineering

The Pennsylvania State University

Mechanical Engineering Graduate Student Handbook

Academic Year 2017-2018



PennState
College of Engineering

**MECHANICAL AND
NUCLEAR ENGINEERING**

This publication is available in alternative media on request. The Pennsylvania State University is committed to the policy that all persons shall have equal access to programs, facilities, admission, and employment without regard to personal characteristics not related to ability, performance, or qualifications as determined by University policy or by state or federal authorities. It is the policy of the University to maintain an academic and work environment free of discrimination, including harassment. The Pennsylvania State University prohibits discrimination and harassment against any person because of age, ancestry, color, disability or handicap, national origin, race, religious creed, sex, sexual orientation, gender identity, or veteran status. Discrimination or harassment against faculty, staff, or students will not be tolerated at The Pennsylvania State University. Direct all inquiries regarding the nondiscrimination policy to the Affirmative Action Director, The Pennsylvania State University, 328 Boucke Building, University Park, PA 16802- 2801; Tel 814-865-4700/V, 814-863-1150/TTY.

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Section I – General Information for Graduate Students

GRADUATE PROGRAM OFFICE

The Graduate Program Office for Mechanical and Nuclear Engineering is located in 127 Reber Building. The office is supervised by the Associate Department Head for Graduate Studies, Dr. Mary I. Frecker. Records Specialists, Julie Coons and Jason Nachman, are available to assist students between the hours of 8:00 am -5:00 pm on Mondays through Fridays.

General functions of the Graduate Programs Office are to:

- 1) Assist students with administrative questions, documents and submitting theses and dissertations;
- 2) Prepare material for consideration and action by the department graduate faculty or Associate Head of MNE Graduate Programs;
- 3) Review applicants for admission to graduate study;
- 4) Recruit the highest quality graduate students, and;
- 5) Administer the Ph.D. Candidacy Exam.

The Graduate Program Office is guided and assisted in these duties by several faculty committees including the Graduate Policy Committee, the Graduate Admissions Committee, the Graduate Recruiting Committee and the Ph.D. Candidacy Committee. Committee members are appointed by the Department Head, Karen Thole.

ID CARDS

- Every Penn State campus has an office that issues id+ cards. There is no charge for your first card.
- When you come to the id+ Office, you'll need to present a valid driver's license, passport, state-issued photo ID, military ID, government-issued photo ID, high school photo ID with a Social Security Card, college ID with a Social Security Card, or a Permanent Resident Card. Without one of these valid forms of ID, we cannot issue you an id+ card.
- University Park Students
- Graduate students can get their card at the id+ Office (20 HUB-Robeson Center). Students transferring to University Park from another Penn State campus don't need a new id+ card.

20 HUB-Robeson Center

Phone: 814-865-7590

Email: idcard@psu.edu

PSU EMAIL

The Graduate Program Office uses e-mail to notify students of various announcements, events, etc. All graduate students are required to use their Penn State e-mail account for all correspondence regarding your academics. If you choose to use an account other than the one provided you are responsible for all information contained in your PSU account. Please refer to the Information Technology Services (ITS) website for more information: <http://identity.psu.edu/services/authentication-services/access-accounts/>.

Additionally, the MNE Graduate Programs Office sends a newsletter by e-mail to all MNE graduate students approximately on a weekly basis during the Fall and Spring Semesters which contains information about job opportunities, fellowships, university activities, workshops, etc.

MAIL HANDLING

1. Incoming graduate student mail will be placed in an alphabetized unit found inside of 127 Reber building. CHECK YOUR MAIL WEEKLY. MAIL IS NOT HELD FOR AN INDEFINATE PERIOD OF TIME.
2. The faculty and staff mailroom is located opposite Room 224 on the second floor of Reber Building. First class mail and inter-office mail for faculty and staff is sent from or picked up in the mailroom. The default mailing address for graduate students is 127 Reber Building.
3. Do not use a Department mailing address to receive personal items. The Department is not responsible for loss or theft of any personal mail delivered for you to a Department address.

PARKING

Every employee or student, including wage payroll, part-time, or Fixed Term I and II, must have a parking permit to park on campus. Individuals enrolled in classes at Penn State are classified as students and must obtain student parking through the Parking Office. Please refer to policies and online registration procedures at: <http://www.transportation.psu.edu/>.

Graduate students may purchase a base student permit through the Parking Office located at Room 1 Eisenhower Parking Deck where they will register their vehicle.

Parking information is available at: <http://www.transportation.psu.edu/parking/student/permits.shtml>.

OFFICES, KEYS, TELEPHONES, SUPPLIES, AND COPIES

OFFICES - Students on teaching assistantships will be provided access to room 337 Reber which provides a meeting space so they can carry out their responsibilities as teaching assistants.

Students on research assistantships will be provided desk space by their research advisor.

KEYS - Keys are individually numbered and assigned to each person. If you terminate your graduate studies or graduate, keys must be returned to the MNE Business Office in 132 Reber Building. Access to Reber Building is gained by the use of the PSU student ID card.

OFFICE TELEPHONES – TA offices have telephones which can be used for making on-campus calls or local calls. These phones do not have long-distance capability.

PURCHASE OF EQUIPMENT AND SUPPLY ITEMS - Listed below is a brief overview. We stress that you ask questions before ordering anything.

School supplies and books are personal expenses and may not be charged to any departmental budget, teaching or research. Teaching assistants in need of supplies from the supply closet should stop by 127 Reber Building for assistance. Research assistants should see their faculty advisor for advice on how to obtain office supplies, if needed; the supply closet does not stock items for use by RAs. For ordering laboratory supplies, equipment items, etc. -- there are several different procedures, depending on the type of item, vendor, and price range. Before placing any order, check with your supervising faculty member or the appropriate staff assistant. If you order something on your own with the intent of eventually charging a University budget and violate University policy, you may be personally liable for the purchase price. Take time to review the procedure with someone who knows the system before you order and you will avoid complications.

COPY MACHINES – Copy machines are located on the 2nd and 3rd floors of Reber Bldg. (Room 236 and Room 336). Your graduate research advisor can provide authorization to access these copiers. If you are a teaching assistant, you may use copiers on campus, such as in the engineering library, by using your PSU ID card. Your ID card can be used for copying purposes by setting up a Lion Cash account. If you are using these services for "non-personal" university-related work, ask your faculty supervisor about how to pay for them before you have the work done.

TRAVEL REIMBURSEMENTS

A student who participates in a conference or workshop may be reimbursed for expenses, if the student's advisor wishes to do so. The Graduate Programs Office can provide you with the necessary reimbursement paperwork and answer questions about travel and reimbursement.

PURCHASE OF AIRLINE TICKETS

Airline tickets must be purchased through the PSU travel system. The Graduate Student Office staff or other MNE staff can assist you with this. If you purchase a ticket on your own, you may be liable for the expense.

RESERVATION OF RENTAL CARS

Rental cars must be reserved through the PSU travel system. The Graduate Student Office staff or other MNE staff can assist you with this. If you reserve a rental car on your own, you may be liable for the expense.

REIMBURSEMENT FOR MEALS & OTHER EXPENSES

Retain all receipts for meals, parking, tolls, etc. Submit all of these receipts with your reimbursement request paperwork.

THE INSTRUMENT ROOM

The main function of the Instrument Room (**23 Reber**) is to supply undergraduate students, faculty and staff with equipment for instructional use and in support of undergraduate laboratory courses. Some examples of equipment available are: instrumentation, electronics, dimensional measurement equipment, electrical devices, mechanical devices, audio/ visual equipment, hand tools, power tools, hardware and general consumables. (ie tape, batteries, glue, etc.)

When equipment is not being used for these purposes, equipment may also be signed out for graduate research projects. All items checked out in this manner are subject to recall for instructional use and must be returned promptly when a recall notice is issued.

MECHANICAL ENGINEERING MACHINE SHOP FACILITIES

A fully equipped machine shop, staffed by a professional machinist, is located in 25 Reber building. The tools and equipment in this shop are for use of the professional staff and trained graduate students

All students are required to obtain training from the machinist and possess a Learning Factory machine certification and exhibit competency, before they are allowed to use the equipment in the shop. Training on manual equipment is available for graduate students on individual pieces of equipment.

Students and faculty who wish to have a part fabricated must fill out a [Machine Shop Work Request Form](#) and provide the machinist with a valid department charge number before machining begins. Materials can either be provided to the machinist or a request can be made for the machinist to order the materials and charge the budget number that was provided.

The Machine Shop maintains the highest standards for safety. Users are required to wear closed toe and heel shoe

MECHANICAL & NUCLEAR ENGINEERING Computer Labs

Lab Administrator: Matthew Lindenberg, 201D Reber Building; Phone: 865-6232;
E-mail: matthew@engr.psu.edu

MNE Students have access to several computer laboratories. The department has 2 general use labs; the PC Studio and the Linux Lab. These 2 labs have a combined 45 computers for both general computing use and advanced course related assignments (Matlab, Mathematica, Visual C++, SolidWorks, etc.) The lab is located in 119 & 120 Reber Building. The PC Studio may be accessed 24 hours a day, 7 days a week, via Penn State ID cards. Within the lab, each student is allotted 10GB of space to store files and is given \$15 worth of printing each semester.

MECHANICAL & NUCLEAR ENGINEERING LINUX LAB

Lab Administrator: Matthew Lindenberg, 201D Reber Building; Phone: 865-6232;
E-mail: matthew@engr.psu.edu

The Linux Lab is a "general use" computer laboratory consisting of 8 physical computers (4 additional via SSH only) running the Red Hat Enterprise operating system for the students within Mechanical and Nuclear Engineering. With the funding provided by the tuition surcharge fees from the College of Engineering and Penn State, we are able to replace half of the computers every year, so no computer in this lab is older than 2 years. The lab is located in 307 Reber Building. The Linux Lab may be accessed M-F 7:00am – 6:00pm (Reber Building hours), via Penn State ID cards. Within the lab, each student is allotted 10GB of space to store files and is given \$15 worth of printing each semester.

Section II – General Administrative Procedures

Reporting Resources

The University does not condone wrongful conduct by any member of the Penn State community, no matter what position he or she may hold.

Thus all members of the University community are urged to speak up if they see or suspect illegal, unethical, or unsafe conduct. If you do so, be assured that the University will protect you from retaliation. See AD67 (<https://guru.psu.edu/policies/AD67.html>) or contact the Office of Ethics & Compliance for more information (<http://www.universityethics.psu.edu/>).

The following resources are available for faculty, staff, students, and others:

TO MAKE A REPORT

Crime or emergency situation

- Contact University Police 814-863-1111
- In an emergency, dial **911**

Child abuse, including child sexual abuse

- Contact the Pennsylvania Child Welfare Services "ChildLine" at **800-932-0313** or <https://www.compass.state.pa.us/cwis>
- If the child is in immediate danger, dial **911** first
- You must also email AD72@psu.edu communicating that a report has been made. For more information on AD72, see <https://guru.psu.edu/policies/AD72.html>

Behavioral threat

- Contact the Behavioral Threat Management Team at **855-863-BTMT (2868), 814-863-BTMT (2868)**, reportBTMT@psu.edu or <http://btmt.psu.edu/>

Bias or discrimination

- Contact the Affirmative Action Office at **814-863-0471**
- Visit the Report Bias website: <http://equity.psu.edu/reportbias>
- Students at University Park should call the Lion Support Help Line at 814-863-2020 to report acts of intolerance
- Students at other campuses may contact their campus Student Affairs office to report acts of intolerance

Sexual harassment and other forms of sexual misconduct

- Contact the Affirmative Action Office at **814-863-0471** or another appropriate office listed here: <http://www.psu.edu/dept/aaoffice/sexharass.htm>
- Visit the Office of Sexual Misconduct Prevention & Response website at <http://titleix.psu.edu> to file an online report.
- To file a complaint outside of the University, contact:
 - o The Office for Civil Rights (Philadelphia Office) at **215-656-8541** or email OCR.Philadelphia@ed.gov
 - o The Equal Employment Opportunity Commission (Philadelphia District Office) at **800-669-4000**
 - o The Pennsylvania Human Relations Commission (Harrisburg Regional Office) at **717-787-9780**

Research-related

- Contact the Office for Research Protections at **814-865-1775** or ORProtections@psu.edu

Suspected ethical or policy violations

(including fraud, theft, conflict of interest, retaliation, athletics compliance)

- Use Penn State Ethics and Compliance Hotline at **800-560-1637** or <https://psuethicsandcompliance.tnwreports.com/>. Both are anonymous and available 24/7

TO ASSIST VICTIMS

Sexual violence, sexual abuse or sexual harassment

- The Penn State Sexual Assault and Relationship Violence Hotline is available 24/7 at **800-560-1637 (TTY 866-714-7177)**
- The Office of Sexual Misconduct Prevention & Response website at <http://titleix.psu.edu> includes a list of sexual assault resources for each campus location

- The University-wide designated sexual harassment resource person for students, regardless of sex or gender, is the Director of the Center for Women Students at **814-863-2027** or <http://studentaffairs.psu.edu/womenscenter/>
- The University-wide designated sexual harassment and sexual misconduct resource person for employees is the Vice Provost for Affirmative Action at **814-864-0471**
- For University Park, the Centre County Women's Resource Center Hotline is available 24/7 at **814-234-5050** or **877-234-5050**

All others

- Contact the Center for Counseling and Psychological Services (CAPS) at **814-863-0395** or <http://studentaffairs.psu.edu/counseling/>
- Contact the Employee Assistance Program at **866-799-2728** or <http://ohr.psu.edu/health-matters/employee-assistance-program/>

RESOURCES

All employees should be aware of Penn State's Conflict of Interest policy. Please see the following for more information:

- <http://news.psu.edu/story/143476/2013/01/04/employees-reminded-disclose-conflicts-interest>
- Policy HR91 – Conflict of Interest: <https://guru.psu.edu/policies/OHR/hr91.html>
- Policy RA20 – Disclosure and Management of Significant Financial Interests: <https://guru.psu.edu/policies/RA20.html>
- Policy AD86 – Acceptance of Gifts and Entertainment: <https://guru.psu.edu/policies/AD86.html>

If it is not clear where to turn for assistance, any of these offices will guide the individual to someone who can help:

- Office of Human Resources Employee Relations Division at **814-865-1412** or <http://ohr.psu.edu/employee-relations/>
- Office of University Ethics and Compliance at **814-867-5088** or <http://www.universityethics.psu.edu/>
- Office of Affirmative Action and Title IX Coordinator at **814-863-0471** or <http://www.psu.edu/dept/aaoffice/>
- Office of Student Conduct at **814-863-0342** or <http://studentaffairs.psu.edu/conduct>
- Office of Internal Audit at **814-865-9596** or <http://www.internalaudit.psu.edu/>
- Clery Act Compliance Manager at **814-863-7459** or <http://www.police.psu.edu/clery/>
- Your campus, college, or unit's Human Resources representative. Contact information is available <http://ohr.psu.edu/hr-representatives>

Other Resources for Graduate Students

Counseling and Psychological Services (CAPS) can help students resolve personal concerns that may interfere with their academic progress, social development, and satisfaction at Penn State. Some of the more common concerns include difficulty with friends, roommates, or family members; depression and anxiety; sexual identity; lack of motivation or difficulty relaxing, concentrating or studying; eating disorders; sexual assault and sexual abuse recovery; and uncertainties about personal values and beliefs. <http://studentaffairs.psu.edu/counseling/>

Graduate & Professional Student Association (GPSA)

The GPSA, <http://gpsa.psu.edu/> is the representative body for all graduate students. The GPSA addresses issues of concern to graduate students and elects members to sit on shared-governance bodies of the University. The GPSA also organizes social events for graduate students. Members and officers of the GPSA can help graduate students become more involved (academically or socially) in university life. The GPSA office has information on most services available at Penn State. If students need help navigating campus, various offices around campus and finding other organizations, the GPSA can help.

Graduate Degree Programs Bulletin

The Graduate Degree Programs Bulletin (<http://bulletins.psu.edu/bulletins/whitebook/index.cfm>) has information regarding academic procedures, registration requirements, conduct, resolution of problems and procedures for termination, MS degree and Ph.D. degree requirements, as well as other procedures, regulations and requirements as related to graduate study.

UNIVERSITY HEALTH SERVICES

The University Health Service is located in the Student Health Center which is adjacent to the Eisenhower Parking Deck and the Bank of America Career Services Building off Bigler Road. Its facilities are available to all students, including graduate students at all levels of training.

HEALTH INSURANCE

Health insurance is mandatory for all Graduate Students and Student with an RA or TA appointment are automatically enrolled. As a Graduate Assistant or Graduate Fellow, you are eligible to receive subsidies for the Graduate Assistant and Graduate Fellow medical, dental and vision plans for you and any eligible dependents. Students enrolled in the university health insurance plan have their premiums automatically deducted from their paycheck. The deadline to purchase, decline, or change dependents for Fall 17 is 8/5/17.

You are urged to review the policies at <http://studentaffairs.psu.edu/health/services/insurance/> and contact University Health Services directly at 814-865-6556 if you have and questions regarding Penn State Student Health insurance.

LionPATH

LionPATH: <http://launch.lionpath.psu.edu/node/2> is Penn State's student information system, which provides students with access to their academic, registration, and financial records. Students can enroll for classes, view/accept their financial aid awards, and view their tuition bills.

Consent to Do Business Electronically

The first time students log in to LionPATH, they must sign the Consent to Do Business Electronically agreement in order to use the system. While not technically a part of enrollment, this screen will prevent all other actions until students have clicked the box to indicate their agreement. If they do not agree, students will have to conduct LionPATH business outside of the system.

Complete the Pre-Registration Activity Guide and sign the Financial Responsibility Agreement

Students will not be eligible to enroll in classes until they have completed the Pre-Registration Activity Guide, which includes verification of emergency contact information and the new Financial Responsibility Agreement (FRA). The FRA is a promise to take financial responsibility for payment of the student account. A Financial Responsibility hold will remain on a student's account until he/she has completed the Activity Guide. If not yet completed, the Activity Guide can be found in the student's To Do List within the LionPATH Student Center. For more information on how to complete the Pre-Registration Activity Guide, please go to <http://lionpathsupport.psu.edu/student-help/>

ENROLLING IN CLASSES

Course Registration – All students must register for classes **before Monday, August 28**. If you do not register before that date, you will be assessed a late-add fee and a late registration fee. If you are on a half-time graduate assistantship, you must register for 9-12 credits per semester. International students must be registered full- Time or for 9 credits in order to maintain their visa status.

Incoming Students

Courses for the first semester will be selected after consultation with the MNE Associate Head of Graduate Programs unless a permanent advisor has already been selected

Enrolled Students

Courses will be selected after consultation with your academic advisor. For doctoral students, the courses will be in accord with the program approved by your doctoral committee.

FULL-TIME ACADEMIC STATUS

Full-time academic status is achieved by taking appropriate course loads. Most loan granting agencies and other organizations will consider a 9-credit course load to be full-time status, fulfilling their registration requirements. The U.S. Immigration and Customs Enforcement (ICE) requires that all international students on student visas must achieve "full-time Academic status" during the Fall and Spring semesters. Exceptions to this rule are possible under certain conditions. Students should contact the University Office of Global Programs for further information. For ICE purposes, a course load of nine credits is considered full-time during Fall and Spring semesters, and during the Summer semester, international students do not have to register. Any graduate student registered for ME 601 (Note: Student must have passed the Ph.D. comprehensive exam in the prior semester) is considered to have full-time academic status. For full details, see the Graduate Degree Programs Bulletin website at <http://bulletins.psu.edu/bulletins/whitebook/index.cfm>.

TUITION BILLS

After enrolling in classes, all students will receive a tuition bill that can be viewed on Lionpath. Students who are on an assistantship should monitor their bill closely and inform the MNE Graduate Office if they receive a late fee. A delay currently exists between the timing of the Bursar's bill due dates and when tuition assistance for students on assistantships are processed.

ACADEMIC ADVISOR

Each graduate student will have an academic advisor chosen in agreement between the student and the faculty member. For master's students, the faculty member who supervises the thesis (or paper) will be the academic advisor. For doctoral students, the research advisor will be the academic advisor. The Associate Head of Graduate Programs will initially act as the temporary advisor for incoming graduate students. The student is responsible for obtaining a permanent academic advisor and designing a program of graduate study with the advisor.

Master's students with academic advisors who are not faculty members of the Mechanical and Nuclear Engineering Department are required to have a co-advisor in the department.

It is imperative that students identify an academic advisor as soon as possible. It is the student's responsibility to inquire with faculty about the availability of research assistantships and research topics of mutual interest.

OBLIGATIONS AND RESPONSIBILITIES OF GRADUATE STUDENTS

A large number of graduate students are appointed as graduate assistants. They are assigned tasks in teaching, research, or other activities which are educationally significant.

The privileges and benefits as well as the obligations and responsibilities of graduate assistants are:

A. Privileges and Benefits

1. Eligible for financial assistance (grant-in-aid, tuition waivers and stipend).
2. Eligible for services at the Student Health Center.
3. Eligible for participation in Accident and Sickness Insurance Plan of the Graduate Student Association.
4. Eligible to use Penn State Career Services (<http://studentaffairs.psu.edu/career/>).
5. Participation in the program of the Graduate Student Association.
6. Eligible to join undergraduate student organizations, except those whose constitutions limit membership to undergraduates.

B. Obligations and Responsibilities

1. Maintain scholarship satisfactory to department.
2. Make progress in degree program acceptable to department, which includes eighteen weeks of service each semester as a graduate assistant.
3. Assume full responsibility for knowing the regulations and pertinent procedures of the Graduate School.
4. Forego other employment while a graduate assistant as required by the Graduate School.
5. Meet standards of conduct outlined by the Division of Student Affairs – Office of Student Conduct – Code of Conduct for Penn State students. Please go to the following website for details: <http://studentaffairs.psu.edu/conduct/codeofconduct/>.
6. Register for the appropriate number of courses/credits per semester.
7. Meet standards of the department for behavior in the performance of assigned duties.
8. Exercise the privileges and obligations of academic freedom.

RESPONSIBILITIES OF RESEARCH AND TEACHING ASSISTANTS

Assistantships are contracts to provide services to the Department in research or teaching for which a stipend plus tuition coverage is received. Your specific duties will be assigned by the faculty member to whom you have been appointed. A half-time assistantship allows a student to schedule 9-12 credits per semester, receive a stipend plus grant-in-aid of resident education tuition and certain other benefits, and perform tasks that, on the average, occupy approximately 20 hours per week. Research duties often coincide with the student's graduate research. Teaching responsibilities and the faculty member to whom you are assigned begin and end each semester. Lack of satisfactory progress or performance of duties can result in termination of the assistantship contract at any time. Graduate students who are appointed for fall/spring assistantships or fellowships are eligible for the Summer Tuition Assistance Program (STAP). This program allows students who are required to be registered during summer session to have the tuition paid by PSU Graduate School. Detailed information about eligibility and the procedure to apply is sent to all MNE graduate students in late spring.

Teaching Assistants

Graduate students are eligible to apply for available teaching assistantships. Normally, teaching assistantships will only be given for one academic year, i.e., Fall and Spring Semesters. Students continuing their studies during the Summer should pursue research funding, internships off campus or other employment opportunities. Students who are required to register for courses during the Summer Session may apply for tuition assistance. In order for international students to qualify they must receive a satisfactory score on the AEOCPT test which is administered by the Department of Applied Linguistics.

Flex Teaching Assistants

Flex TA offers were sent to students starting Fall 2017. These students are offered two semesters of TA support which can be used at any point in their academic career. (Students admitted before Fall 2017 generally received a TA offer valid for only the *first* two semesters.)

Research Assistantships

For the most part, research assistants are students supported by faculty with externally funded research projects. Continuation of a research assistantship depends on the quality of the work performed and the availability of external funds.

INTERNATIONAL STUDENTS

In order for international students with student visas to maintain their visa status through Penn State, they must meet several obligations which are listed in detail on the Office of Global Programs website at:

<https://global.psu.edu/info/internationals-psu/students/maintenance-status/enrollment>.

Regardless of whether the international student is receiving or appointed on a graduate assistantship, they must:

Maintain full-time academic status. Graduate students will enroll for variable credits up to twelve (12), with nine (9) credits being the minimum required to fulfill DHS visa requirements for full-time enrollment.

Exceptions to full-time study must be approved by their faculty advisor and department **in advance** by completing the Request for Less Than Full-Time Enrollment Form, signed by their faculty advisor and submitted to their International Student Adviser at University Office of Global Programs, 410 Boucke Building. All exceptions granted by the International Student Adviser must be reported to DHS within 21 days as well as the return to full-time status. Note: Exceptions to full-time study due to academic difficulties are limited to one semester during the entire program of study; documented medical illnesses are limited to one year during the program of study. Failure to enroll for full-time study or to obtain approval from the International Student Adviser in advance is automatically out-of-status.

Credit Loads for International Students

The Department of Homeland Security requires that international students proceed in a timely fashion toward completion of their degrees, as established by the academic department and (usually) stated on their initial immigration document. Failure to maintain normal progress toward completion of the degree during this period will jeopardize the student's ability to continue academic study, adjust status, or seek future employment in the United States. Because of this, students should not be enrolled less than full-time during fall or spring semester without approval of Directorate of International Student and Scholar Advising (DISSA).

The U.S. Department of Homeland Security requires the DISSA to report violations of status, including failure to maintain full-time enrollment. The following is intended to provide guidance for international graduate students and for DISSA in determining full-time status:

- A graduate student is considered full-time if registered for a minimum of 9 credits, excluding courses taken for audit, or if a Ph.D. candidate who has successfully completed the comprehensive examination and is registered for SUBJ 601.
- Under all circumstances, international students must maintain registration for at least 1 credit as stipulated earlier in this bulletin. (See Academic Information and Procedures/International Students.)

International students with student visas must normally maintain full-time academic status during the Fall and Spring semesters, irrespective of whether they are receiving assistantships. Any exception to this policy must be approved by the University Office of Global Programs (UOGP). In an effort to make required immigration processes for international students (**work authorization – CPT/OPT, reduced course loads and program extensions**) more efficient, less-expensive, and more secure for all parties, UOGP has transferred all processes to a paperless system called iStart. International students may obtain part-time (wage payroll) work on campus for a

maximum of 20 hours per week during any semester after completing an I-9 (Employment Eligibility Form and W-4 in 410 Boucke Building). For any specific questions regarding visas, academic status, work permits, etc., students should contact UOGP. For more information, please refer to the University Office of Global Programs website at: <http://global.psu.edu> .

EMPLOYMENT REQUIREMENTS/OPTIONS FOR INTERNATIONAL STUDENTS

All international students must be enrolled full-time (9-12 credits per semester) and may work up to 20 hours per week. International students may work up to 40 hours per week on campus during Summer Sessions.

Curricular practical training (CPT), employment which is an integral part of an established curriculum, is available to F-1 students who have been lawfully enrolled on a full-time basis for one academic year. Students in English language programs are ineligible for practical training. To be considered CPT, the work must not only be related to the major field of study but must also be an integral or important part of studies.

Students who have been in F-1 status for at least one academic year are eligible for optional practical training (OPT) which is temporary employment in their field of study for purposes of gaining practical experience.

For further information pertaining to employment of International Students, please refer to the University Office of Global Programs website: <http://global.psu.edu/>.

AMERICAN ENGLISH ORAL COMMUNICATIVE PROFICIENCY TEST (AEOCPT)

All international students who have been offered teaching assistantships and graderships which involve interaction with undergraduate students are required to have passed the American English Oral Communicative Proficiency Test (AEOCPT), as a result of a State law and Penn State Faculty Senate Legislation. This test is administered before the semester begins by the Department of Applied Linguistics (<http://aplng.la.psu.edu/programs/about-the-aeocpt>). All international graduate students offered teaching assistantships must take and pass this test.

Section III –Academic Procedures for Graduate Students

GRADING SYSTEM

Grades shall be assigned to individual students on the basis of the instructor's judgment of the student's scholastic achievement using the grading system below.

Undergraduate and Graduate Grading System

Quality of Performance		Grade	Grade Point Equivalent
Excellent	Exceptional Achievement	A	4.00
		A-	3.67

Good	Extensive Achievement	B+	3.33
		B	3.00
		B-	2.67
		C+	2.33
Satisfactory	Acceptable Achievement (Does not count for Graduate Study)	C	2.00
		D	1.00
Failure	Inadequate Achievement (To secure credit, course must be repeated.)	F	0.00

A minimum grade-point average of 3.00 for work done at the University is required for graduation.

UNSATISFACTORY SCHOLARSHIP

A graduate student who fails to maintain satisfactory scholarship or to make acceptable progress in a degree program may be dropped from the University. One or more failing grades or a cumulative grade-point average below 3.00 for any semester or session or combination of semesters and/or sessions may be considered as evidence of failure to maintain satisfactory scholarship. Action may be initiated by the department or committee in charge of the graduate major or by the chair of the student's committee.

DEADLINES

It is the responsibility of the student working with his/ her advisor and committee to ensure that all deadlines established by the Graduate School are met. (<http://www.gradschool.psu.edu/calendars/important-dates/>). Extensions should not be expected, and are granted by the Graduate School only under exceptional circumstances.

MINORS

Many MNE students take graduate – level minors in other programs, or in special areas such as the Graduate Minor Program on Computational Science, (<http://www.csci.psu.edu/minor.html>). It is the student's responsibility to make sure, that all requirements are met. **Ph.D. students must inform the Graduate School of their intent to take a graduate – level minor before taking their comprehensive exam.** Minors must be requested in conjunction with the establishment of PhD committees or prior to the semester of graduation for Master's students. The Graduate School will decline late requests, as the intent is that a minor should be an integral part of the student's graduate program, not an afterthought.

COURSE LOAD

Full-time students and students receiving fellowships should register for 9-12 credits per semester. All students (US and international) receiving assistantships should register for the following:

Appointment	Fall/Spring	Summer
1/4-time assistantship	9-14 credits/semester	5-7 credits
1/2-time assistantship	9-12 credits	4-6 credits
3/4-time assistantship	6-8 credits	3-5 credits

MS students are not required to register for course work or research once the course requirements have been met, although international students may need to register for courses in order to maintain their visa status. The

Graduate School requires that all students receive a cumulative grade point average of 3.0 or better to graduate. After passing the comprehensive exam, all Ph.D. students must maintain "continuous registration," which requires them to register for ME 601 (Ph.D. Thesis Preparation) for the Fall and Spring semesters. If Ph.D. students plan to take their oral or comprehensive exams during the Summer Session, they must be registered. Also, Ph.D. students must spend at least two semesters over some 12-month period during the interval between admission to candidacy and completion of the Ph.D. program as a registered full-time student. For full details, see the Graduate Degree Programs Bulletin website at <http://bulletins.psu.edu/bulletins/whitebook/index.cfm>.

DROPPING/ADDING/AUDITING COURSES

DROPPING and ADDING COURSES

If you are considering adding or dropping a course, there are many factors you will want to consider:

- Is there still time to drop or add a course?
- Will dropping a course affect my progress towards my degree?
- Will a change in my course schedule have financial implications?
- If an international student, will a change in my course schedule have an impact on my visa status? Remember, international graduate students must be registered full-time or for at least 9 credits in order to maintain their visa status during fall and spring semesters.

Penn State University maintains three periods relating to course drops: the pre-semester period, the add-drop period, and the late drop period.

1. The **pre-semester period** begins on the first day of scheduling and ends the day before the semester starts. While exceptional circumstances may necessitate the need to process schedule changes after classes begin, students are encouraged to finalize all schedule changes prior to the first day of the semester.
2. The **regular drop/add period** begins the day that your courses start, and is when dropping a course can be made without receiving a drop/add fee. Dropping a course during this time means that:
 - Length of drop period is ten days during fall/spring for full-semester courses and is a calculated proportional length for all other courses (see Registrar's Academic Calendar http://registrar.psu.edu/academic_calendar/calendar_index.cfm)
 - No signature(s) required.
 - **No fee**
3. A student can drop a course with certain restrictions and requirements. They are: **late drop period** starts the day after the regular drop period and before the late drop deadline,
 - No signature(s) required
 - A fee for each transaction
 - Courses are recorded on the student record

Changing your overall number of credits after your course begins can have financial implications.

Before making any registration changes consult with your academic adviser.

- When you are a full-time student and drop below full-time status, your overall number of credits changes. This can impact the tuition, fees, student aid, and refunds applied to your bursar account. Additionally, during the late drop period, the University assesses processing fee for any course dropped or added. The tuition adjustment is determined by the effective date of the drop and is made according to Penn State's Tuition Adjustment Schedule. Visit the Tuition Adjustment Policy at: <http://www.bursar.psu.edu/adjustments.cfm>. If you are a full-time graduate student (i.e., 9 or more credits) who drops a course but still remains at full-time status, you will not incur the same impacts on your bursar account, as the tuition rate is flat once full-time enrollment is reached.
- You will also want to investigate whether you are meeting the "Satisfactory Academic Progress" standards for federal financial aid programs when considering a course drop. Details about satisfactory academic progress is available at the <http://studentaid.psu.edu/> website.
- During the pre-semester period, you can add and drop courses as many times as needed to create a suitable schedule without the same financial implications. Please be mindful to check your tuition bill for updates if you make changes to your schedule (especially adding credits) after you have already paid your tuition bill.

AUDITING COURSES

Courses taken formally as audit are not included in the maximum number of credits required for assistantships or for satisfying visa requirements for international students. **The request to audit a course must be done within the regular drop add period.** The adding of an audited course after the regular drop/add period is not permitted. Courses cannot be changed to an audit after the semester has begun. Requests to take a course for audit must be made to the program that offers the course.

TRANSFER OF CREDITS

Transfer of Credit from an External Institution

- A maximum of six (6) credits of high-quality graduate work done at a regionally accredited institution or recognized degree-granting institution may be applied toward the requirements for a master's degree. However, credits earned to complete a previous master's degree, whether at Penn State or elsewhere, may not be applied to a second master's or doctoral degree at Penn State. Credit transfers are not allowed for the Ph.D. degree.
- Approval to apply any transferred credits toward a degree program must be granted by the program head or graduate officer, and the Graduate School.
- Transfer credits must meet the following criteria:
 - o Must have been earned at a regionally accredited institution or a recognized degree-granting institution;
 - o Must be of "A" or "B" grade value ("B-" grades are not acceptable; pass-fail grades are not transferable unless substantiated by the former institution as having at least "B" quality);
 - o Must appear on an official graduate transcript;
 - o Must be earned within the five years prior to the date of registration to a degree program at Penn State.

Forms for transfer of credit may be found at <http://gradschool.psu.edu/current-students/>

Transfer of Nondegree Graduate Credits

Approval to apply nondegree graduate credits toward a degree program must be granted by the program head or graduate officer, and the Graduate School. A maximum of 15 credits earned at PSU as a nondegree student may be applied to a degree program.

- The credits must have been earned within five years preceding entry into the degree program. Requests to transfer graduate work taken more than five years prior to admission into a graduate degree program must be accompanied by a letter justifying the validity of the course work.
- Only 400, 500 and 800-level graduate courses may be transferred.
- Any courses taken by a graduate student in non-degree status that are not transferred into the degree program (as requested by the student and approved by the graduate program) will be coded as "credits not applied toward the degree" (NDC) and, therefore, will not count in the total credits earned towards the degree and the degree grade-point average. (Revised by Graduate Council, December 2010; implemented, Fall 2011.)
- Only A, B, and C grades will be transferred. D and F grades will be marked "NDC."

Forms for transfer of credit may be obtained from the graduate program.

SUGGESTED CORE COURSES

Students are expected to select courses and write a thesis or paper in one or more of the following general fields within Mechanical Engineering:

Thermal Sciences
Heat Transfer
Combustion
Fluid Mechanics

Mechanical Sciences
Systems and Controls
Dynamics, Vibrations and Noise Control
Solid Mechanics and Mechanical Design

The following listing of suggested core courses and other related courses in each of these six areas is provided for guidance. Your advisor and/or committee may suggest alternative or additional courses. Most of the courses listed below are offered on a regular basis. New experimental courses may be offered from time to time; these will be numbered as ME597x. The on-line schedule of courses (see below) will show which courses are being offered each semester.

<u>FIELD</u>	<u>CORE COURSES</u>	<u>RELATED COURSES</u>
Heat Transfer	ME 512, 513, 514, 521, 523	ME 411, 504 , 515, 520, 522 527, 530
Combustion	ME 521, 530, 532, 535, 537	ME 400, 404, 430, 431, 432, 504, 512, 513, 514, 520, 522 , 523, 527, 533; AERSP 412
Fluids	ME 512, 513, 520, 521, 522, 523; AERSP 423	ME 405, 420 , 514, 515, 524, 526, 527, 530, 532
Systems and Controls	ME 550, 554, 555	ME 455, 558, 559
Dynamics, Vibrations and Noise Control	ME 571, 572, 573, 580, 581	ME 452, 470, 471; ACS 510; E MCH 525
Solid Mechanics and Mechanical Design	ME 560, ME 563, ME 564, 565; E MCH 507, 560, ME 560	ME 460, 461, 462, 463, 480, 481, 546, 572 ; CE 541, 548; E MCH 506, 509, 531, 532, 540, 546

MATHEMATICS REQUIREMENT

The Master of Science degree program in Mechanical Engineering requires three credits of mathematics.

These credits must be taken from the following group of courses:

E MCH 524A, E MCH 524B, ME 512, ME 550, ME 597 (Adv. Engr Math), and all 400 and 500 level "MATH" designated courses (MATH 4XX, MATH 5XX) except MATH 419, 427, 428, 435, 451, 455, 456, 461, 470, 471, 475, 475W, 482 and 484. **Courses with a specific focus on numerical analysis will not count toward the mathematics requirement.**

COLLOQUIUM REQUIREMENTS (ME 590)

All graduate students must successfully complete two credits of ME 590 Colloquium in their first two semesters in the program. For M.S. students these two credits are not counted towards the 30 credit total required for completion of a M.S. degree.

ME 596, 597, 600 (610), 601 (611)

Graduate students registering for these courses must first consult with their advisor (or the instructor if different from advisor) to insure that they are registering for the appropriate course. Failure to select the correct course may require the student to pay "retroactive drop/add fees" and perhaps additional course-credit fees. The MNE Graduate Programs staff can also assist graduate students in registering for the appropriate course.

ME 596 - INDIVIDUAL STUDIES "Paper Research" - Creative projects, including non-thesis research, that are supervised on an individual basis and which fall outside the scope of formal courses. ME 596 cannot be used for M.S. or Ph.D. thesis research. A minimum of 3 credits of ME 596, supervised by the student's advisor is required when submitting a research paper or using Option C (completion of the comprehensive exam) to meet degree requirements.

ME 597 - SPECIAL TOPICS - Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.

ME 600 (610 Off Campus) - THESIS RESEARCH - This course should be used to register for M.S. and Ph.D. thesis research. A minimum of 6 credits of ME 600, supervised by the student's advisor is required when submitting a thesis. There is no limit on the total number of credits of 600 a student can take. However, there is a maximum number of credits which a student can receive a quality letter grade (A, B, etc.). A student must receive a non-letter grade (R, etc.) for any additional credits of 596/600. The R grade is assigned for satisfactory completion of research (<http://bulletins.psu.edu/graduate/academicprocedures/procedures6>).

LIMITS ON RESEARCH CREDITS (ME 600)

Students registering for 600 or 610 should be aware that Graduate Council has established limits on the total number of research credits that can be assigned letter grades in a student's program (i.e., other than R). Students are not permitted to have more graded credits of research than stated by the policy: <http://bulletins.psu.edu/graduate/academicprocedures/procedures5>

Maximum number of graded credits of ME 600

MS only – 6 credits

PhD only – 12 credits

PhD with an "MS along the way" (MS paper or Option C) – 12 credits

PhD with an "MS along the way" (MS thesis) – 18 credits

ME 601 (611 Part time) - Ph.D. THESIS PREPARATION – Only Ph.D. students who have passed the comprehensive examination are permitted to enroll in 601. Ph.D. students are eligible for 601 in the semester following their comprehensive exam and have met the two semester residency requirement. Ph.D. students can register for one additional course either for credit or audit (up to 3 credits) when they are registered for ME 601/611. Students who are eligible must contact the MNE Graduate staff to enroll in ME 601. Note that ME 601 cannot be used to meet the residency requirement.

It is vital that graduate students consult with their advisor prior to each semester's registration to ensure that they are registering for the appropriate courses.

FACULTY RESEARCH INTERESTS

A list of faculty members in Mechanical and Nuclear Engineering can be found at the MNE website: <http://www.mne.psu.edu/>. The MNE faculty directory contains information on each MNE faculty member, including an overview of the faculty member's expertise or research interest areas, publications, current and past research projects, affiliations, education, honors/awards, etc. The directory is a useful resource for graduate students seeking a research advisor.

Scholarship and Research Integrity (SARI)

Based on guidance provided by the Council of Graduate Schools in a report entitled “Graduate Education for the Responsible Conduct of Research (RCR),” the Scholarship and Research Integrity (SARI) program is an opportunity to engage graduate students broadly in a dialog surrounding issues pertinent to research ethics. The SARI program has two parts.

PART 1. SARI

- SARI RCR (Responsible Conduct of Research) portion of SARI – complete during first year
- CITI – complete during first semester

PART 2. CITI On-line training

All graduate students in MNE are required to complete the on-line CITI training program for **engineering** within their first semester. Completion of the CITI program will result in a certificate of completion. Failure to comply will preclude certification for graduation by the Department.

1. Go to <http://citi.psu.edu/>
2. Select “Log in to CITI” under University Park
3. Enter your PSU credentials. (If this does not work, go to <https://www.citiprogram.org/> instead, and create a username and password to access the CITI online training.)
4. Select the course called “Responsible Conduct of Research (RCR) – Basic”
5. Remember to email the certificate to grad@mne.psu.edu after completing the course.

Section IV –Degree Programs

MASTER OF SCIENCE DEGREE PROGRAM

The objective of the Master of Science degree program is to gain advanced knowledge for research, analysis, and design in Mechanical Engineering. The coursework requirements are:

1. Minimum of 30 graduate course credits, of which 20 must be earned at University Park. The required course credits must be completed with a grade point average of 3.00 or higher.
2. At least 18 credits in 500 and 600 level courses.

OPTION A - M.S. THESIS

Candidate registers for a minimum of **six credits of ME 600** and submits a thesis following the procedures specified by the Graduate School. This program will consist of at least 24 course credits of which 12 credits must be at the 500 level, and in addition completion of six thesis credits. At least twelve credits must be 400 or 500 level Mechanical Engineering courses. ME 596 does not count towards the requirements for the thesis option.

OPTION B - M.S. PAPER

Candidate registers for 30 course credits of which **18 credits must be at the 500 level**. Candidate must complete **three credits of ME 596** which can be counted in the total of 30 credits. At least twelve credits must be 400 or 500 level Mechanical Engineering courses. Candidates write a paper on a topic mutually agreed upon by the advisor suitable for publication in a professional journal or presentation at a national or international conference. Please refer to the MS Paper Guide below for details. ME 600 does not count towards the requirements for the paper option.

3. A minimum of 12 credits in 400 and 500 level courses in Mechanical Engineering. **ME 410, 440W, 441W, 450, and any other required undergraduate courses cannot be included in these 12 credits.** NOTE: ME 596 cannot be used to fulfill this requirement. ME 596 cannot be used as a substitute for ME 600. 596 courses in other departments cannot be used to fulfill ME course requirements.
4. The Master of Science degree program in Mechanical Engineering requires three credits of mathematics. These credits must be taken from the following group of courses:
E MCH 524A, E MCH 524B, ME 512, ME 550, and all 400 and 500 level "MATH" designated courses (MATH 4XX, MATH 5XX) except MATH 419, 427, 428, 435, 451, 455, 456, 461, 470, 471, 475, 475W, 482 and 484. Courses with a specific focus on numerical analysis will not count toward the mathematics requirement.
5. All master's degree students will present the results of their thesis, paper, at a meeting consisting of their advisor and the thesis or paper reviewer (who is a member of the ME Graduate Faculty), and other members of the faculty and graduate student body. This requirement may be waived if the student makes a presentation at a national or international scientific conference.
6. Preparatory course(s) required for teaching assistants (such as ENGR 888), remedial courses, and any courses required in our undergraduate program are not counted toward degree requirements.
7. All students must successfully complete two credits of ME 590 Colloquium in their first two semesters in the program. These two colloquium credits do not count toward the 30 graduate course credits in Requirement 1 above.
8. All students must complete SARI/CITI (Scholarship and Research Integrity) training.

OPTION C - Ph.D. RESEARCH PROPOSAL

Ph.D. candidates must submit a dissertation research proposal, demonstrating scholarship and ability to plan a major research activity, to their doctoral committee for approval. This proposal may be used in lieu of an MS paper per Option B above. Requirements are:

1. successful completion of the candidacy examination;
2. completion of required courses matching Option B – MS Paper per above;
3. acceptance of the research proposal by their doctoral committee, and
4. designating this option to the MNE Graduate Office **prior to completion of the comprehensive exam.**

M.S. Paper Guide

To ensure that M.S. papers meet accepted professional quality standards, the following guidelines have been established by the M.E. graduate faculty. Compliance will be monitored and enforced by the paper advisor, the paper reader and the Associate Head of Graduate Programs.

In content, length and structure, the paper is expected to be one that would be acceptable for publication in a peer-reviewed professional journal, or for presentation at a peer-reviewed national or international conference. Examples of papers that would not meet this standard would be a technical report to a sponsor, a presentation at a local or regional conference, or a presentation at a conference where selection is not based on a full-paper peer-review process.

In the case of a multiple-author paper, the degree candidate must be the first author, and the paper must be primarily the work of the degree candidate. If there are coauthors other than the degree candidate and his/her faculty advisor, then a brief summary of the contributions of each coauthor and an estimate of each coauthor's percentage of effort must be included.

If the paper has already been published and/or presented, or has been accepted for publication and/or presentation, then the actual journal- or conference-formatted paper or manuscript should be submitted. Documentation must be provided to show that the paper has been published and/or presented, or has been accepted for publication and/or presentation. The role of the reader in this case is primarily to confirm that the target journal or conference meets the criteria outlined above, and that the documentation is in order.

If the paper has been submitted for publication or presentation, but has not yet been accepted, then the actual journal- or conference-formatted manuscript should be submitted. Documentation must be provided to show that the manuscript is under consideration for publication and/or presentation. If reviewer comments are available, those should be provided. In addition to confirming that the journal or conference is appropriate, the reader in this case will effectively have the role of a peer reviewer, and will judge whether the manuscript is, in principle, suitable for publication in the target journal or presentation at the target conference.

If the paper has not yet been submitted for publication and/or presentation, but will be in the near future, then the requirements in the previous paragraph still apply, with the exception of the requirement to provide documentation that the paper is under consideration.

Finally, if the paper is not one that has been or will be submitted for publication or presentation, then an appropriate target journal or conference must be selected by the student and paper advisor, and the paper must be prepared as if it were going to be submitted to that journal or conference. An appropriate template to use in this case would be the one that is available for ASME technical papers, for example (see <http://www.asme.org/kb/proceedings/proceedings/author-templates>). In this case, the paper reader must judge whether the paper would be acceptable, in principle, for publication in the target journal or presentation at the target conference. This option will place a greater burden on the reader, as he/she will not have the advantage of knowing that external peer reviewers are also reading and evaluating the paper.

THESIS GUIDE

The Graduate School Office of Thesis and Publications provides a [Thesis Guide](#), which provides formatting instructions, can be located at on the Penn State Graduate School site at <http://www.gradsch.psu.edu/current/thesis.html>. The Penn State Thesis Template can be found at <http://www.sas.psu.edu/penn-state-thesis-template/>.

M.S. THESIS/PAPER APPROVAL PROCEDURE

Selection of a Faculty Reviewer (Reader)

Master's thesis and paper reviewers are chosen by the student in conjunction with their advisor. The reader must be a member of the Mechanical Engineering Graduate Faculty and be appointed in a timely manner to ensure they have adequate time to review the work. If a reader is unable to be determined one can be assigned by the Associate Head of Graduate Programs upon request.

Oral Presentation of Thesis or Paper

All master's degree students will present the results of their thesis or paper at a meeting consisting of their advisor, thesis or paper reviewer – who is a member of the ME Graduate Faculty, and other members of the faculty and graduate student body. This requirement may be waived if the student makes a presentation at a national or international scientific conference.

To the Graduate Student: A typed draft of the thesis/paper must receive three approval signatures in the order indicated on the M.S. Thesis/Paper Approval Form. A reviewer can be appointed by the Associate Head of the Graduate Programs upon request of the thesis/paper advisor. Each thesis/paper is reviewed by the Head of the Department. The completed approval form must be given to the Graduate Program staff assistant to be filed in the student's folder.

To the Thesis/Paper Advisor: If there are questions or problems concerning the reviewer's comments, the thesis/paper advisor should arrange for a discussion with the reviewer. When the advisor and the reviewer have reached agreement, the advisor shall direct the candidate to make any necessary changes. Minor editorial changes in pencil are acceptable, but major text changes should be retyped before the reviewer signs the approval form.

To the Reviewer: After reading the manuscript, prepare written comments to communicate with the thesis/paper advisor concerning any changes you believe are essential. Minor corrections or editorial changes can, of course, be noted without discussion. If you wish to discuss the material with the candidate, it is recommended that you do so in the presence of the thesis advisor.

Thesis, Dissertation, Performance and Oral Presentation Deadlines Calendar

Important Deadlines for Fall 2017, and Spring 2018 can be found on the Graduate School's site listed below. In addition the MNE Graduate Programs Office will send specific Instructions regarding graduation at the beginning of each semester.

The following deadlines are for theses, dissertations, DMA performances, and DNP final oral presentations only. Students writing master's papers must contact the MNE Graduate Programs Office for deadlines.

<http://gradschool.psu.edu/current-students/etd/thesisdissertationperformance-calendar/>

Submitting Thesis to Graduate School after "Last Date to Submit Thesis":

If a student submits his/her thesis to the Graduate School after the dates above, but before the semester ends, he/she will graduate at the next scheduled graduation and will not be required to register for the subsequent semester. Upon request, the Graduate School will provide an official letter of certification indicating that the student has completed all the requirements of the degree. Allow two weeks for your request to be processed.

DOCTOR OF PHILOSOPHY DEGREE PROGRAM

PH.D. COURSE REQUIREMENTS

There are no formal course requirements for the Ph.D. degree beyond the Colloquium Requirements described above. Course requirements are established solely by the doctoral committee. Historically, 30 or more course credits beyond the M.S. degree have typically been prescribed by ME doctoral committees.

MECHANICAL ENGINEERING CANDIDACY EXAM

According to the Graduate University Bulletin: "A student who has been admitted to the Graduate School and has been accepted by the department or committee in charge of a major program in which the doctorate is offered may begin working toward a doctoral degree. However, the student has no official status as a doctoral student and no assurance of acceptance as a doctoral candidate until the candidacy examination has been passed." <http://www.bulletins.psu.edu/graduate/degree/requirements/degreeReq1#doctoralAdmission>

Formal admission to the doctoral program is based on passing the doctoral candidacy examination, which is administered by the Department faculty.

Immediately after passing the candidacy examination, a doctoral committee must be formed. The members of the committee will be selected by the academic advisor in consultation with the student. The advisor will recommend the members to the Department Head, who in turn will notify the Graduate School. The MNE Graduate Programs staff assistant will provide the Ph.D. committee form to the student after the committee is approved by the Department Head. Students who fail to locate an advisor for the doctoral program after passing the exam will be advised that such action constitutes "unsatisfactory scholarship," which can be grounds for dismissal from the University.

Graduate students who wish to become doctoral candidates must be approved for candidacy by the graduate faculty of their major department. The approval is based on:

- a) the academic record of the student;
- b) a candidacy examination given by the major department; and
- c) evidence of research capability based on advisor recommendations.

Therefore, it is essential that a new student begin working with an advisor as soon as possible.

Purpose

The purpose of the candidacy examination is to assess a student's potential to excel in their Ph.D. studies and to conduct research at the highest level in their chosen field of study. Preparing for this examination will help students strengthen their knowledge of fundamentals across the Mechanical Engineering discipline.

Timing

Graduate School requirements for the candidacy examination are:

- The Department strongly encourages students to take the candidacy examination at the earliest possible time. (The timing for taking the exam is self-determined and should be made in consultation with your advisor.)
- the student must be registered as a full-time or part-time degree student for the semester (excluding summer session) in which the examination is taken; and,
- the student is required to demonstrate a high level of competence in the use of the English language, including reading, writing and speaking.

The candidacy examination will be administered each Fall and each Spring semester. Dates for the candidacy examination will be announced by the Graduate Programs Office by e-mail to all graduate students.

ME PHD CANDIDACY

Timing

The ME candidacy exam is offered every Fall and Spring semester, around the second week of classes. The exam takes place over the course of one week; written exams are usually on Tuesday-Friday and oral exams are on Saturday.

Format

The candidacy examination will consist of three sections. Each section will include one written exam and oral exam, both in the same topic area. Students may select topic areas for the three sections from the topic list provided below.

An English proficiency assessment will also be conducted after the candidacy exam. See the next section for additional details.

Written exams

Written exams will be three hours in duration. All written exams will be closed book unless a different format is announced prior to the exam. Exam problems will be contributed and graded by faculty with expertise in respective areas. Samples of written candidacy exams will be provided to students in **PDF format**. Individual written exams will be coded for anonymity in grading.

The material covered in written exams will be at the terminal B.S. level. While the material is based on the baccalaureate degree, the examining committee expects understanding, competency and maturity acquired in graduate study. The committee expects candidates to possess knowledge and understanding of mechanical engineering principles, to be able to recall them quickly, and to synthesize them accurately. An important aspect is to assess the way in which the candidate thinks about a given problem and then approaches the solution to that problem.

Three scores, one from each written exam, will be reported on a 0 to 10 scale with below 5 recommended fail and above 7 recommended pass.

Oral exams

Topic areas for oral exams will correspond to written exams. Two faculty evaluators will conduct each oral exam. The student's advisor may observe oral exams, but may not ask or answer questions during exams.

Three scores, one from each oral exam, will be reported on a 0 to 10 scale with below 5 recommended fail and above 7 recommended pass. This score will be based on technical performance and not on oral communication skills.

Student evaluation

A student will be accepted or denied admission to doctoral study in Mechanical Engineering following an evaluation by the Mechanical Engineering Graduate Faculty at a special faculty meeting devoted solely to recommendations from the written and oral exams.

At that meeting, three ballots will be held for each student. The faculty will vote to either pass or fail each student on each of the three respective sections. Each student must pass three different sections to be admitted into candidacy.

If a student does not pass all sections on the first attempt, that student will be allowed a second attempt to take the examination. That student must pass each section that is taken on the second attempt. Students will not be required to retake any section(s) that they passed previously. Students may switch topic areas for the second attempt.

Topic areas

Seven standard topic areas are described below – Solid Mechanics, Rigid Body Mechanics, System Dynamics, Fundamentals of Engineering Analysis, Thermodynamics, Fluid Mechanics and Heat Transfer. Standard topic areas will be reviewed and updated on a three year cycle.

A new provisional topic area may be considered by written request to the Graduate Programs Office from at least three Mechanical Engineering Graduate Faculty members who provide a formal description of the topic area similar to below and who volunteer to serve as examiners for that area. The formal description must contain a list of topic areas to be covered and citations for at least two textbooks from which students may study the specified topics.

A new provisional topic area must be approved by majority vote of the Mechanical Engineering Graduate Faculty before it is offered and added to the list of standard topic areas.

If a standard topic area is not selected by at least one student during any three year period, the Graduate Policy Committee will consider removing it from the list of standard topic areas. Removal must be approved by majority vote of the Mechanical Engineering Graduate Faculty.

Solid Mechanics

Topics may include:

- Equilibrium of a differential element, plane stress and plane strain, stress and strain transformations, stress-strain relations, compatibility conditions, strain energy and Castigliano's theorem.
- Failure theories.
- Uniaxial loading and deformation, statically indeterminate problems, temperature effects, torsion and bending.
- Thin walled sections.
- Elastic solution of thick walled cylinders.

Texts: *Advanced Strength and Applied Elasticity*, Ugural and Fenster, Prentice-Hall, 2003 *Energy and Finite-Element Methods in Structural Mechanics*, Chapter 1, Shames and Dym, Taylor & Francis Group, 1996.

Recommended Courses: EMch 11, 13, 215, ME 360 Mechanical Design; material also reviewed in ME 560 Solid Mechanics

Rigid Body Mechanics

Topics may include:

- Kinematics of particles, rigid bodies and mechanisms.
- Dynamics of particles, rigid bodies and mechanisms.
- Work, energy and impulse-momentum principles.

Texts: *Engineering Mechanics: Dynamics*, Gray, Costanzo and Plesha, McGraw-Hill
Vibration of Mechanical Systems, Sinha, Cambridge University Press

Recommended Courses: EMch 212, ME 370 Vibrations of Mechanical Systems or equivalent

System Dynamics

Topics may include:

- Vibration in mechanical systems involving transient as well as steady state motion.
- Elementary mechanical, electrical, fluid and thermal systems.
- Emphasis on basic modeling, differential equation derivation and solution.
- Basic concepts of feedback controls.

Texts: *Mechanical Vibrations*, Rao, Addison-Wesley
Dynamic Modeling and Control of Engineering Systems, Shearer and Kulakowski, Macmillan
Recommended Courses: ME 450 Modeling of Dynamic Systems or equivalent; ME 455 Automatic Control Systems

Fundamentals of Engineering Analysis

This Ph.D. candidacy examination in the topic area: *Fundamentals of Engineering Analysis* will have an organizational structure of a 3-hour written examination and a 30-minute oral examination. The written examination will consist of three questions, where one question will be set from each of the following three areas:

- *Fundamentals of Advanced Calculus*: Numerical Sequences & Series; Continuity; Differentiation; Mean Value Theorem & Taylor Series Expansion; Closed, Bounded, Convex Sets; Riemann-Stieltjes Integral; Sequences & Series of Functions. [Reference Courses: Math 140, 141, and 231] [Typical Online Course: Introduction to Analysis (<http://ocw.mit.edu/courses/mathematics/18-100a-introduction-to-analysis-fall-2012/>)] [Typical Textbooks: (1) Principles of Mathematical Analysis by W. Rudin 1976 – Chapters 1 to 7 (pp. 1-165) and (2) Complex Variables by Brown & Churchill, 8th ed., 2009 – Chapters 1 to 5 (pp. 1-228)]
- *Fundamentals of Ordinary and Partial Differential Equations*: ODEs and Power series solutions, Linear second order (i.e., elliptic, parabolic and hyperbolic) PDEs; Prototype problems (e.g., Wave equation, Heat equation, Laplace equation); Solution techniques (e.g., Separation of variables, Green's function, Method of characteristics). [Reference Course: Math 251] [Typical Online Courses: (<http://ocw.mit.edu/courses/mathematics/18-03sc-differential-equations-fall-2011/>) and (<http://ocw.mit.edu/courses/mathematics/18-152-introduction-to-partial-differential-equations-fall-2011/>)] [Typical Textbooks: (1) Advanced Engineering Mathematics, 10th ed. by E. Kreyszig 2011 – Relevant chapters and (2) Advanced Engineering Mathematics by L. Turyn 2013 – Relevant Chapters]
- *Fundamentals of Linear Algebra*: Gaussian Elimination; Simultaneous Linear Algebraic Equations; Orthogonal Projections and Least Squares; Eigenvalues and Eigenvectors; and Quadratic Forms & Positive Definite Matrices. [Reference Course: Math 220] [Typical Online Course: <http://ocw.mit.edu/courses/mathematics/18-06sc-linear-algebra-fall-2011/>)] [Typical Textbooks: (1) Linear Algebra and Its Applications, 4th ed. by G. Strang 2006 – Chapters 1 to 3 and Chapters 5 & 6 and (2) Linear Algebra Done Right, 2nd ed. By S. Axler 1997 – Chapters 1 to 6 (pp 1-122)]

Although each of the three questions in the written examination will be based on undergraduate syllabi, review of the graduate course *ME (EE) 550 Fundamentals of Engineering Systems Analysis*, which is scheduled to be offered in the Fall semester of every year, should be useful for graduate understanding of the undergraduate materials in both written and oral examinations.

Thermodynamics

Topics may include:

- First and Second Law analysis of steady and transient systems from the energy and availability standpoint;
- properties of pure solids, liquids and real and ideal gases; mixtures of gases and liquids,
- psychrometrics;
- thermochemical calculations and chemical equilibrium;
- analysis of energy conversion devices.

Text: *Fundamentals of Engineering Thermodynamics*, Moran and Shapiro, Wiley

Recommended Courses: ME 300 Engineering Thermodynamics, ME 400 Thermodynamics of Propulsion and Power Systems, and ME 430 Introduction to Combustion, or equivalent

Fluid Mechanics

Topics may include:

- Basic principles: constitutive relations, Eulerian/Lagrangian descriptions of fluid motion, fluid properties, stream function, and vorticity.
- Hydrostatics and pressure.

- Application of conservation equations in both integral and differential form to fluid systems.
- Internal viscous flows: velocity and pressure distributions in laminar and turbulent flows, transition to turbulence, and pipe flow.
- External flows: boundary layer theory, separation, lift, and drag.
- Approximations used in fluid mechanics: Bernoulli equation, potential flow theory, and Stokes flow.
- Dimensional analysis and turbomachinery.
- One dimensional compressible flow: isentropic flow, choking, and normal shocks.

Texts: *Fluid Mechanics*, Cengel and Cimbala, McGraw-Hill

Fluid Mechanics, White, McGraw-Hill

Fundamentals of Fluid Mechanics, Munson, Young, and Okiishi, Wiley

Introduction to Fluid Mechanics, Fox & McDonald, Wiley

Viscous Fluid Flow, White, McGraw-Hill or similar texts.

Recommended Courses: ME 320 Fluid Flow, ME 420 Compressible Flow I, and review of material in ME 521 Foundations of Fluid Mechanics I, or equivalent

Heat Transfer

Topics may include:

- Conduction--transient and steady state;
- Convection--laminar and turbulent flow for internal and external, forced and natural convection systems;
- Thermal radiation;
- Heat exchanger thermal analysis and design.

Text: *Fundamentals of Heat and Mass Transfer*, Incropera and DeWitt, Wiley

Recommended Courses: ME 410 Heat Transfer; material also reviewed in ME 411 Heat-Exchanger Design, ME 512 Conduction, ME 513 Convection, and ME 514 Radiation

ENGLISH PROFICIENCY ASSESSMENT

A candidate for the degree of Doctor of Philosophy is required by the Graduate School to demonstrate high-level competence in the use of the English language, including reading, writing and speaking.

There is no specific language and communication requirement for Ph.D. students other than the English proficiency requirement and the research proposal requirement described below.

Oral Communication

Oral communication skills of all students will be assessed in the semester in which they pass the candidacy examination. Assessment will be either satisfactory or deficient. All students judged to be deficient will be required to take a speech communication course and pass it with a grade of B or better prior to taking the comprehensive exam.

Each student will prepare and deliver a seven minute (maximum) presentation whose subject area is in one of the standard topics that constitute the candidacy exam. The audience for the presentation will be two faculty evaluators in addition to other Ph.D. candidates making their presentations. Following the presentation, the examining committee may ask questions. The student's advisor may observe the presentation, but may not ask or answer questions.

The topic for the presentation is entirely up to the student. It is the ability to communicate, not the technical content of the talk that will be evaluated. Therefore, it is in the student's best interest to pick a topic with which they are familiar. For example, topic areas may be from research, classes, etc.

Written Communication

Written communication skills of all students will be assessed in the semester in which they pass the candidacy examination. Assessment will be either satisfactory or deficient. All students judged to be deficient will be required to take a technical writing course and pass it with a grade of B or better prior to taking the comprehensive exam.

During a three-hour period, the student will be asked to read a short article related to an area of general interest in engineering. The student may be asked to answer a few short questions related to the article in order to ascertain his or her reading skills. The major portion of the assessment will be writing a response to a more general question related to the content of article. Anonymous evaluation will be performed by selected faculty members.

ME PHD DOCTORAL COMMITTEE Mechanical Engineering DOCTORAL COMMITTEE Policy

When a graduate student has passed the candidacy examination, a Ph.D. committee should be formed IMMEDIATELY to ensure the student will receive proper guidance early in their program. It is expected that your Ph.D. committee is established well in advance of scheduling your Comprehensive Examination. The candidate and the candidate's advisor should discuss possible committee members. The committee must have a minimum of four members of the Penn State Graduate Faculty, one of which must represent a field outside the candidate's major field of study in order provide a broader range of disciplinary perspectives and expertise. This committee member is referred to as the "Outside Field Member." In practice this usually means a faculty member outside of MNE. Additionally, in order to avoid potential conflicts of interest, the primary appointment of at least one regular member of the doctoral committee must be in an administrative unit that is outside the unit in which the dissertation adviser's primary appointment is held. This committee member is referred to as the "Outside Unit Member." Two members must be members of the Mechanical Engineering Graduate Faculty. Names of the proposed committee should be forwarded the Associate Department Head for Graduate Programs for approval through the MNE Graduate Programs Office. The Associate Department Head for Graduate Programs may approve the suggested committee members or may discuss possible changes and will request the Graduate School to form the committee. The Graduate School will appoint the committee and notify all persons concerned. At this point, the student's program is under the complete control of their Ph.D. committee. The MNE. Graduate Program Office will only keep records and monitor progress. The function and organization of the doctoral committee are as follows:

Chair: The chair is responsible for the administrative aspects of the doctoral program and coordinating the committee's activities. The chair convenes later meetings of the committee. **The chair or co-chair must be a member of the Mechanical Engineering Graduate Faculty.** If the chair is also the research advisor, he/she has the following additional responsibilities:

- a) direct the research program;
- b) assist the student in selecting courses;
- c) supervise and release:
 - research proposal
 - final draft of thesis for defense;

d) approve the final copy of thesis that will be sent to the Graduate School.

Planning Meeting: This meeting should occur immediately (normally 30 days) after the doctoral committee is formed. The objective of the meeting is as follows:

- a) brief comments by student including academic record and work or educational experience;
- b) define a tentative series of courses to be taken by the student;
- c) select manner in which communication requirement will be satisfied;
- d) define a tentative time schedule.

The committee should meet as a body at least once a year to review the status of the student's research and program of study. Alternatively, the student can meet individually (at least once a year) with each committee member for these purposes. If there is a substantial change in the student's program of study or research objective, the committee should meet. A written record of this meeting describing these changes must be sent to the Department for inclusion in the student's official records.

Once a committee is established any requests to alter the committee membership must be made in writing to the Graduate Programs Office: grad@mne.psu.edu. All members currently on the committee and any member(s) to be added must be cc'd on the request.

ME PHD COMPREHENSIVE EXAMINATION

The purpose of the comprehensive examination is to demonstrate that candidates are qualified to successfully complete the research phase of the program. This requires that students:

- a) have substantially completed the program of courses approved by their committee with a minimum grade point average of 3.00;
- b) have satisfied the English proficiency requirement; and,
- c) have spent at least two consecutive semesters in a twelve-month period as a full-time registered student during which time they were engaged in full-time academic work at the University Park Campus (see Graduate Bulletin).

The comprehensive exam should cover the specific areas of Mechanical Engineering, designated by the student's Ph.D. committee, which relate to the student's program and the minor field of study (if elected or required). The comprehensive exam will consist of an oral examination administered by the student's doctoral committee, which will include two parts:

- Part 1: Presentation of a proposal related to thesis research. The main purpose of this part will be to demonstrate the candidate's technical communications skills and his/her competency of the subject matter closely related to the thesis topic.
- Part 2: Structured oral examination. The main purpose of this part will be to demonstrate the candidate's in-depth knowledge in related areas of research.

The comprehensive examination will also require a written proposal related to candidate's planned research. The written research proposal should contain:

- a) Statement of the research problem;
- b) Literature review;
- c) Preliminary results, if available;
- d) Work plan describing methods of analysis and/or experimentation;
- e) Most significant results expected from the research and their impact on the current state of the art in the main area of the research;
- f) Time schedule.

A written exam may also be given at the discretion of the committee. A student must receive a favorable vote of at least two-thirds of the members of the Ph.D. committee for this requirement to be met. The Graduate School requires that all members of the committee be present at the scheduled exam time.

The comprehensive exam is scheduled by the Graduate School upon request from the Associate Head of Graduate Programs, following notification from the chair of the doctoral committee. The student must be registered the semester of the exam. It is the responsibility of the Ph.D. committee chair to complete all procedures and see that all requirements are met. It is the responsibility of the Ph.D. student to be certain that the committee chair performs these duties in a timely and accurate manner. **The Graduate School requires at least two weeks' notice of requested exams.**

PH.D. THESIS REVIEW PROCEDURE

The Ph.D. dissertation will be reviewed by each member of the student's doctoral committee. Prior to submission to each committee member, the thesis draft should have been read by the thesis advisor and approved. Each member of the committee should have a minimum of two weeks to carefully read the thesis draft.

DOCTORAL FINAL ORAL EXAMINATION - THESIS DEFENSE

The purpose of this examination is for students to defend their Ph.D. dissertation. In the interim between successful completion of the comprehensive examination and the final oral examination, the following regulations apply:

1. Requests for scheduling the oral examination should be made in writing by the student's committee chair to the Associate Head of Graduate Programs. The Graduate Program Office will then request the exam be scheduled through the Graduate School. NOTE: The Graduate School requires at least two weeks' notice for examinations to be scheduled.
2. Candidate must be continuously registered and maintain their student status until passing the final oral examination and their thesis is accepted by their Ph.D. committee. This may be satisfied by registering (Fall and Spring semesters) for course work; M.E. 601 and M.E. 611 are for Ph.D. thesis preparation and are full-time, non-credit courses. Students may register for one or more credits of ME 600 to satisfy this requirement.
3. When a period of more than five years has elapsed between passing of the comprehensive examination and the completion of his/her program, the student is required to pass a second comprehensive examination before the final oral examination can be scheduled.
4. The final oral examination may not be scheduled until at least three months have elapsed after the comprehensive examination was passed, although the Department Head may grant a waiver in the case of an outstanding student.
5. The final oral examination will be administered by the student's **entire** Ph.D. committee and will be a defense of the student's dissertation. The student must receive a favorable vote of at least two-thirds of the members of his/her doctoral committee. The final oral exam will be publicized and members of the academic community are encouraged to attend.

PH.D. THESIS DEADLINES

The following deadlines are approximate, and firm dates are to be established by the Graduate School. Thus they are subject to change. **Students who planning to graduate should refer to the Thesis Office calendar for exact dates.** The Graduate School calendar can be located at <http://www.gradschool.psu.edu/current-students/etd/thesisdissertationperformance-calendar/>.

Submitting Thesis to Graduate School after "Last Date to Submit Thesis":

If students submit their thesis to the Graduate School after the dates above, but before the semester ends, they will graduate at the next scheduled graduation and will not be required to register for this subsequent semester. Upon request, the Graduate School will provide an official letter of certification indicating that the student has completed all the requirements of the degree. Allow two weeks for your request to be processed.

GRADUATE STUDENT CHECK-OUT SHEET

Before leaving the Department, every student is required to complete a check-out sheet with appropriate signatures and a “Transfer/Separation” form.

EXIT INTERVIEWS

Every graduate student must schedule an exit interview with the Associate Head of Graduate Programs. Schedule your interview well in advance of your leaving the University and complete the evaluation form prior to your interview.