# 2015-2016 GRADUATE STUDENT HANDBOOK

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Section A – 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 Head of MNE Graduate Programs, Daniel C. Haworth. Staff Assistants, Julie Coons and Jason Nachman, are available to assist students between the hours of 8:00 am -5:00 pm.

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

All graduate students are assigned a nine-digit ID number upon applying to the PSU Graduate School. ID cards can be obtained at the ID+ Office in the HUB-Robeson Center. New graduate students are required to show proof of enrollment (i.e., enrollment in classes) in order to obtain their ID card. Take your Penn State photo ID card to one of the Penn State Access Account signature stations listed below and follow the instructions there. Make note of your user ID and password when they are displayed on the screen. Your account should be active within one business day. If you have problems using the Penn State Access Account signature station, please contact computer support staff at the location of the signature station (if applicable), the ITS Computer Accounts Office, one of the ITS consulting locations at University Park, or consulting locations at other campuses. Signature Station Locations: Signature Stations are located at the following locations (University Park Campus):

- University Park:
  - 103 Boucke Building
  - 204 Wagner Building (ITS Help Desk and Accounts Services Office)
  - 6 Findlay Commons
  - 15 Sparks
  - 201 Pollock Library
  - 112 Shields Building Lobby area (2 Kiosks)
  - 107 Waring Commons
- 107 Warnock Commons
- W130 Pattee (ITS Service Desk at Knowledge Commons)
- 109 Willard Building
- 205 Redifer Building
- 5A Katz Building
- 170 Physical Plant Building (Monday through Friday, 7:00 a.m.- 3:30 p.m.)
- 329 Building, Suite 306 OTS Lobby (Monday through Friday, 7:30 a.m. - 5:00 p.m.)

**Note:** Penn State Access Account signature stations are available during regular lab hours. A campus map and hours for each of these locations can be obtained at [http://clc.its.psu.edu/labs](http://clc.its.psu.edu/labs) on the Web.

Locations and hours are subject to change. See [http://identity.psu.edu/services/authentication-services/access-accounts/signature-stations/](http://identity.psu.edu/services/authentication-services/access-accounts/signature-stations/) on the Web. Student accounts remain active during periods of continuous enrollment (fall and spring semester) and for six months after graduation.

**E-LION**

eLion is a web-based system that provides students with current student records, registration, and transcripts. Students can add classes, drop classes, view unofficial transcripts, check on registration, look at course schedules, check on the status of any loans and fees charged to their bursar account, and file an intent to graduate. Access to student records is restricted by the student’s access account.

**ENROLLING IN CLASSES**

Students can add/drop classes on eLion ([https://elion.psu.edu/](https://elion.psu.edu/)). The listing of courses is found at: [http://schedule.psu.edu/](http://schedule.psu.edu/). Students can also ask for assistance from the Graduate Programs Office when enrolling in classes for the first time.

**TUITION BILLS AND CONFIRMING ATTENDANCE/REGISTRATION**

After enrolling in classes, all students will receive an e-mail notification from the PSU Bursar’s Office requiring payment of tuition. Students should follow the instructions outlined in the e-mail - Do not ignore this e-mail. Tuition and fees are covered under assistantships/fellowships. Tuition will not be paid until the student completes the appropriate payroll paperwork and the assistantship is processed.

Students receiving departmental support (a TA or RA assistantship) must confirm their registration with the Bursar’s Office after registering for courses. After registering for classes, call the Bursar’s Office – 814-865-6528 – and inform them that you will be receiving a TA or RA appointment for the given semester. You may be asked to provide a copy of your signed Terms of Offer.

If you do not do so on time, you will be charged a fee by the Office of the Bursar. (The deadline for confirming registration varies depending on the date a student registers for courses. Check the e-mail from the Bursar’s Office for deadline information.) More information about completing registration can be found at: [http://www.registrar.psu.edu/registration/completing_registration.cfm](http://www.registrar.psu.edu/registration/completing_registration.cfm).

Students who are unsure of the procedure can contact the MNE Graduate Programs staff in 127 Reber Building for assistance.
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 no later than the end of the first semester. It is the student’s responsibility to inquire with faculty about the availability of research assistantships and research topics of mutual interest. Research assistantships are usually not easy to find and competition is stiff.

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. The course listings in Section E provide some guidance on course selection.

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 as shown in the following pages. 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.
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:

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<th>Appointment</th>
<th>Fall/Spring</th>
<th>Summer</th>
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<tr>
<td>1/4-time assistantship</td>
<td>9-14 credits/semester</td>
<td>5-7 credits</td>
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<tr>
<td>1/2-time assistantship</td>
<td>9-12 credits</td>
<td>4-6 credits</td>
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<tr>
<td>3/4-time assistantship</td>
<td>6-8 credits</td>
<td>3-5 credits</td>
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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.

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/.

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. The AEOCPT is offered several times a year by the Department of Applied Linguistics, 305 Sparks Building. It is the responsibility of the students to satisfactorily complete the AEOCPT if they are interested in applying for a TA or grader's position in Mechanical Engineering. For full details, please refer to the Applied Linguistics ITA program website at: http://aplng.la.psu.edu/academicPrograms/itaProgram.shtml.
STUDENT INSURANCE

Health insurance is mandatory for all international students (and their dependents) who are supported on assistantships/fellowships or who are self-supported. US students on other health care plans may file a waiver on-line with the Student Insurance Office if they are covered under another health insurance plan. International students may file a declination form on-line but they must present evidence of being covered under another health care plan which is equivalent to the Penn State plan. Students on assistantships/fellowships are automatically enrolled in the medical, dental and vision plans. Insurance premiums are deducted monthly from the assistantship stipend. Penn State will pay 80% of insurance coverage and the student is responsible for 20%. Students who are not on assistantships/fellowships must pre-pay for health care coverage. Booklets for this type of coverage are available from the Student Health Insurance Office in 302 Student Health Center on line at: http://studentaffairs.psu.edu/health/services/insurance/.

Your insurance subsidy for your eligible dependents is 70% of the annual premium expense. As with the subsidy for your individual insurances, the university will pay 70% of the premium expense directly to the insurance companies and you will pay your 30% of the premium costs through a payroll deduction.

Detailed information on health insurance, including the health insurance booklet, enrollment deadlines and table of monthly payroll deductions is available at: http://studentaffairs.psu.edu/health/services/insurance/.

Contact the Graduate Benefits Office for more information about student insurance – 865-7467.

Graduate students who have external fellowships (fellowships not processed through the Penn State payroll system) may apply to get the PSU student health insurance package and the graduate assistant tuition rate. Please see the administrative support staff members in 127 Reber for more information.

DROPPING/ADDING/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. Students wishing to drop or add courses must consult with their advisor before taking any action. Students on assistantships should not change their schedules to reduce or increase their course credits beyond the limits indicated previously under "Course Load." Students can drop and add courses using Penn State’s eLion system (https://elion.psu.edu/). Students wishing to drop/add or audit a course in MNE or another department may also contact the MNE Graduate Programs staff for assistance.

ME 596, 597/598, 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 - Creative projects, including non-thesis research, that are supervised on an individual basis and which fall outside the scope of formal courses. ME 596 should not be used for M.S. or Ph.D. thesis research.
ME 597/598 - 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. Instructors usually award an "R" grade for this course, but may award a letter grade for up to six credits for M.S. students and 12 credits for Ph.D. students.

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 for ME 601 must see the MNE Graduate staff to enroll in ME 601.

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.

TRANSFER OF CREDITS

Students should follow the general University guidelines given under "Transfer Credit" in the Graduate Degree Programs Bulletin. Students must obtain approval of the Associate Head of Graduate Programs or the Department Head to obtain credits for courses taken elsewhere. As a general department policy, no more than six credits will be allowed to be transferred for the M.S. degree. Credit transfers are not allowed for the Ph.D. degree.

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 should inform the Graduate School of their intent to take a graduate-level minor well before taking their comprehensive exam. 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.

GRADING SYSTEM

Effective Fall Semester 1995, a plus/minus grading system went into effect. This grading scale is:

A, 4.00; A-, 3.67; B+, 3.33; B, 3.00; B-, 2.67; C+, 2.33; C, 2.00; D, 1.00; F, 0.
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. International students must receive a satisfactory score on the AEOCPT test which is administered by the Department of Applied Linguistics.

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.

DOCTORAL CANDIDACY EXAMINATION AND DOCTORAL COMMITTEE

Formal admission to the doctoral program is based on passing the doctoral candidacy examination, which is administered by the Department faculty. The graduate faculty of the University requires that the examination may be given after at least 18 credits have been earned in graduate courses beyond the baccalaureate degree. The examination must be taken within three semesters (Summer session does not count) of entry into the doctoral program (Graduate Degree Programs Bulletin). 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 failing to take the examination within this period or failing 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.
DESKS, KEYS, TELEPHONES, SUPPLIES, AND COPIES

DESKS - Students on teaching assistantships will be provided desks and meeting space so they can carry out their responsibilities as teaching assistants. Desk assignments for teaching assistants are made by the MNE Graduate Programs Office staff assistant. Students on research assistantships will be provided desk space by their research advisor. Other graduate students will be allotted desks within the remaining available space.

KEYS - Keys are individually numbered and assigned to each person. If your desk and/or room assignment changes, you terminate your graduate studies or graduate, please return keys to the key custodian who assigned them to you (usually in the MNE Business Office in 132 Reber Building); do not pass them on to another individual. 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 REIMBURSEMENT

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 (located in 23 Reber Building) is to supply tools, instrumentation equipment, and laboratory supply items for instructional use and in support of Undergraduate Laboratory courses. When not in use for these purposes, items may be checked out for graduate research use. 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. Failure to return the item could result in a “hold” being placed on your registration for the following semester or a “hold” being placed on your transcript if you are graduating.

Small quantities of supply items are available from the Instrument Room for use in research laboratories. If you are setting up an experiment which would require more than a small quantity of these types of items, you should arrange to purchase them. Check with your faculty supervisor on how to do this.

Certain items of equipment (i.e., multimeters, audio-visual equipment, certain hand tools) are in very high demand and have specified checkout periods (usually 24 - 48 hours). The Instrument Room Technician will inform you of these periods when you check items out. Please be certain to return these items promptly so they will be available for others to use.

Instrument Room personnel are available during posted hours to assist you with checkout or to answer questions about equipment.

MECHANICAL ENGINEERING MACHINE SHOP FACILITIES
A fully equipped machine shop, staffed by a professional machinist, is located in the basement of Reber Building. The tools and equipment items in this area are for use by our professional staff only. Contact your faculty advisor about how to obtain shop resources.

MECHANICAL & NUCLEAR ENGINEERING PC STUDIO
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 (Word, Excel, Net browsing, E-mail) 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: Allan Knisely, 201C Reber Building; Phone: 865-8267; E-mail: ahk11@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 B – General Administrative Procedures

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:

As a Graduate Student

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.
8. Exercise the privileges and obligations of academic freedom.
A Note to Students About Reporting Resources

All members of the Penn State Community are asked to be mindful of their individual responsibility to keep the University a safe and ethical institution. The following resources are available for faculty, staff, students and others to report any suspected illegal or unethical conduct, and to seek assistance.

- **Reporting a crime**: Contact the campus police or security office. In an emergency, dial 911.

**Assistance for victims of sexual violence, sexual abuse or sexual harassment:**

  - The Penn State Sexual Assault and Relationship Violence Hotline at 800-550-7575 (TIY 866-714-7177), available 24/7.
  - The University-wide designated sexual harassment resource person for students: The Director of Center for Women Students at 814-863-2027, at [http://studentaffairs.psu.edu/womenscenter/](http://studentaffairs.psu.edu/womenscenter/) online.
  - A list of sexual assault resources for each campus location: [http://studentaffairs.psu.edu/womenscenter/resources/ccsar.shtml](http://studentaffairs.psu.edu/womenscenter/resources/ccsar.shtml) online.

- **If a child is a victim of any kind of abuse, including sexual abuse**: Contact the Pennsylvania Child Welfare Services "ChildLine" at 800-932-0313.

- **Reporting ethical violations** (including fraud, theft, conflict of interest and violations of University policy, including research compliance, discrimination and athletics-compliance issues):

  - The Penn State Ethics and Compliance Hotline at 800-560-1637 or [http://www.mycompliancereport.com/brand/psu](http://www.mycompliancereport.com/brand/psu) online, both anonymous and available 24/7.
  - The Penn State Ethics website provides a listing of contacts at [http://www.universityethics.psu.edu/contact_us.shtml](http://www.universityethics.psu.edu/contact_us.shtml) online.

- **The following University offices also are available**:

  - The Employee Relations Division of the Office of Human Resources at 814-865-1412.
  - The Office of Internal Audit at 814-865-9596.
  - College and administrative unit Human Resources Representatives listing at [http://ohr.psu.edu/hr-representatives](http://ohr.psu.edu/hr-representatives) online.
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/](http://studentaffairs.psu.edu/counseling/)

Graduate Student Association (GSA)

The GSA, [http://gpsa.psu.edu/](http://gpsa.psu.edu/) is the representative body for all graduate students. The GSA addresses issues of concern to graduate students and elects members to sit on shared-governance bodies of the University. The GSA also organizes social events for graduate students. Members and officers of the GSA can help graduate students become more involved (academically or socially) in university life. The GSA 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 GSA can help.

Graduate Degree Programs Bulletin

The Graduate Degree Programs Bulletin ([http://bulletins.psu.edu/bulletins/whitebook/index.cfm](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. The Bulletin also provides guidelines for Graduate Assistant Paid Leaves.

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.

Under certain circumstances, international students may apply for less than full-time enrollment. Eligible students must complete a “Request for Reduced Course Load.” The form can be access at the Office of Global Programs website: [https://global.psu.edu/info/internationals-psu/students/forms](https://global.psu.edu/info/internationals-psu/students/forms).

For further information pertaining to employment of International Students, please refer to the University Office of Global Programs website: [http://global.psu.edu/](http://global.psu.edu/).
MAIL HANDLING

1. All outgoing U.S. mail bearing a University return address will be metered. The Department will not buy stamped envelopes or postage stamps. This will include all correspondence -- letters, post cards, packages, certified mail, etc.

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. Personal mail can be mailed from the Department, as long as proper postage is attached.

4. 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.

5. Incoming graduate student mail will be placed in an alphabetized unit found inside of 127 Reber building. YOU SHOULD CHECK YOUR MAIL WEEKLY. MAIL WILL NOT BE HELD FOR AN INDEFINATE PERIOD OF TIME.

ELECTRONIC MAIL

The Graduate Program Office uses e-mail to notify students of various announcements, events, etc. All graduate students are required to have a Penn State e-mail account. It is strongly recommended that you use this email for all correspondence regarding your academics. If you choose to use an account other than the one provided you are still responsible for all information contained in your PSU account. Accounts can be activated at various signature stations at University Park. 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.

MOTOR VEHICLES, BICYCLES AND PARKING

All graduate students must register automobiles, motorcycles, etc., at the Parking Office (1 Eisenhower Parking Deck). Permits are required to drive and park vehicles on the campus. Permit costs are nominal and are required of all graduate students whether they are on an assistantship or not. Bicycles also must be registered. Registration stickers can be obtained at any of the parking booths at campus entrances and at the Office of Police Services, 1 Eisenhower Parking Deck.
Section C – Master of Science Degree Program

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 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.

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. ME 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. A thesis, paper, or doctoral research proposal must be presented to meet the specific requirement of the option selected.

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, preferably 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 will be required to complete SARI (Scholarship and Research Integrity) training. See Section F for details.

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 (not including ME 596), and six thesis credits. At least twelve credits must be 400 or 500 level Mechanical Engineering courses.

OPTION B - M.S. PAPER
Candidate registers for 30 course credits of which 18 credits must be at the 500 level. A maximum of three credits of ME 596 can be counted in the total of 30 credits (not including ME 600). 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.
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.
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 the comprehensive exam.

SELECTING AN ACADEMIC ADVISOR

For the student's first semester, the MNE Associate Head of Graduate Programs serves as temporary advisor until the student has chosen a research advisor. Students are expected to obtain an advisor (a Mechanical Engineering faculty member) before registration for their second semester. Students should feel free to discuss possible advisors with the MNE Associate Head of Graduate Programs.

THESIS GUIDE


M.S. THESIS/PAPER APPROVAL PROCEDURE

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 is 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. Return the manuscript, with written comments, to the Graduate Programs Office, not to the student. If you wish to discuss the material with the candidate, it is recommended that you do so in the presence of the thesis advisor.

Master's thesis and paper reviewers will be assigned by the Associate Head of Graduate Programs in the following manner:
1. After students have obtained their advisor's signature on the M.S. Approval Form, they should deliver one copy of the thesis or paper with the Approval Form to the Graduate Program Office.

2. The Associate Head of Graduate Programs will assign a reviewer.

**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, 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.

**M.S. THESIS/PAPER 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/](http://www.gradschool.psu.edu/current-students/etd/thesisdissertationperformance-calendar/).

- **Fa15** Deadline to file intent to graduate on eLion – September 8, 2015
  Mandatory format review, Thesis Office – October 7, 2015
  Submit thesis to ME Grad Office for review – approximately two weeks after format review
  Last date to submit final, corrected version of thesis to the Graduate School – November 20, 2015.

- **Sp16** Deadline to file intent to graduate on eLion – January 25, 2016
  Mandatory format review, Thesis Office – February 15, 2016
  Submit thesis to ME Grad Office for review – approximately two weeks after format review
  Last date to submit final, corrected version of thesis to the Graduate School – April 4, 2016.

- **Su16** Deadline to file intent to graduate on eLion – third week of June 2016 *(tentative)*
  Mandatory format review, Thesis Office – second week of June 2016 *(tentative)*
  Submit thesis to ME Grad Office for review – approximately two weeks after format review
  Last date to submit final, corrected version of thesis to the Graduate School – third week of July 2016 *(tentative)*

**M.S. Paper:**

Students planning to graduate in a particular semester must complete the paper review process by **approximately** the eighth week of that semester.

- **Fa15** Submit MS paper to ME Graduate Office for review – October 21, 2015
- **Sp16** Submit MS paper to ME Graduate Office for review – February 29, 2016
- **Su16** Submit MS paper to ME Graduate Office for review – June 24, 2016

**PLEASE NOTE: MASTER'S THESES/PAPERS ARE DUE IN THE ME GRADUATE OFFICE FOR DEPARTMENTAL REVIEW AT LEAST TWO WEEKS BEFORE THEY ARE DUE IN THE GRADUATE SCHOOL.**
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.

GRADUATE STUDENT CHECK-OUT

Before leaving the Department, every student is required to complete a check-out sheet with appropriate signatures.

EXIT INTERVIEWS

Every graduate student must schedule an exit interview with Associate Head, MNE Graduate Programs. Schedule your interview well in advance of your leaving the University and complete the evaluation form prior to your interview.
MECHANICAL ENGINEERING M.S. THESIS/PAPER APPROVAL FORM

NAME: ___________________________   SEMESTER OF GRADUATION: __________

DEGREE: ___________________________   FILED INTENT TO GRADUATE?  ☐ Yes  ☐ No

CHECK ONE:  MS Thesis ☐  MS Paper ☐

INSTRUCTIONS

1. Three approval signatures are required for the thesis/paper. When a thesis/paper is ready for review by the faculty reader, a copy should be forwarded to the Graduate Programs Office. A faculty reader will be appointed who: a) is familiar with the subject, and b) must be a member of the Graduate Faculty of Mechanical Engineering. The thesis/paper advisor and faculty reader serve as the thesis/paper committee. The faculty reader and the Department Head expect to review a document that is 1) technically sound, 2) complete with all sections and chapters, and 3) free from grammatical errors. That is, the faculty reader and Department Head should review essentially the final version of the thesis/paper. This form with the advisor's signature MUST accompany the thesis/paper when submitted to the faculty reader. This form with advisor's and faculty reader's signatures MUST accompany the thesis/paper when submitted to the Department Head.

2. The faculty reader is expected to have a minimum of two weeks for reviewing the thesis/paper. Thus proper planning to meet Graduate School deadlines is required. Deadlines for submission to the MNE Graduate Programs Office are around March 25, June 24, and October 30, respectively, for meeting the Spring, Summer and Fall graduation deadlines for submission of a Final Copy of Thesis to Graduate School (dates for submission are found at the graduate calendar: http://www.gradsch.psu.edu/calendar/gradcal.html)

3. M.S. students must present their thesis/paper research orally either: before an audience consisting of no less than the thesis/paper advisor and the faculty reader; or, at a national or international scientific conference.

4. This form with all signatures must be returned to the Graduate Programs Office. One bound copy of the thesis/paper must be provided to the thesis/paper advisor.

THESIS/PAPER APPROVAL

1. Advisor ___________________________ Date ________________
2. Co-advisor (if applicable) ___________________________ Date ________________
3. Faculty Reader ___________________________ Date ________________
4. Department Head ___________________________ Date ________________

SATISFACOTORY ORAL PRESENTATION

1. Advisor ___________________________ Date ________________
2. Co-advisor (if applicable) ___________________________ Date ________________
2. Faculty Reader ___________________________ Date ________________

SUBMISSION TO MNE GRADUATE PROGRAM OFFICE

Graduate Program Office ___________________________ Date ________________

RETURN THIS FORM TO 127 REBER (MNE GRADUATE PROGRAMS OFFICE). DO NOT SUBMIT THIS FORM TO PSU THESIS OFFICE.
PENNSTATE

Department of Mechanical and Nuclear Engineering
Graduate Program in Mechanical Engineering

GRADUATE STUDENT CHECK-OUT SHEET

Mechanical Engineering graduate students should follow the procedure listed below before leaving the University to ensure that they are in good standing at the time of their departure. The procedure consists of obtaining the signature of the following individuals, ascertaining that the student has fulfilled all obligations in the MNE Department. This form should be returned to the MNE Graduate Program Office to be included with your permanent file.

Student’s Name __________________________________________ Date ____________________________

Thesis/Paper Status: Complete / Incomplete
(Circle One)

Graduation Date ________________ Have you filed your intent to graduate? ______

The student named above has fulfilled all obligations in the following areas:

<table>
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<tr>
<th>The student named above has fulfilled all obligations in the following areas:</th>
<th>Signature</th>
<th>Date</th>
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</thead>
<tbody>
<tr>
<td>1. Instrument Room (equipment returned)</td>
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<td></td>
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<tr>
<td>2. Budget Administrative Assistant:</td>
<td></td>
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<tr>
<td>• Keys returned</td>
<td></td>
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<td>3. Advisor:</td>
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<tr>
<td>• Oral presentation of thesis</td>
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<td>• Name removed from computer accounts</td>
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<td>• All borrowed equipment returned</td>
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<tr>
<td>• Laboratory cleaned up</td>
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<tr>
<td>• Arrangements made for completion of thesis, etc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Associate Head of Graduate Programs:</td>
<td></td>
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<tr>
<td>• Certification of all degree requirements and transmission of information to the Graduate School</td>
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<tr>
<td>5. Personal interview with Associate Head:</td>
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<tr>
<td>(Schedule with MNE Graduate Program Staff at least 7 days in advance)</td>
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</table>

AFTER ALL SIGNATURES ARE OBTAINED, RETURN THIS FORM TO THE MNE GRADUATE PROGRAM OFFICE, 127 REBER BLDG.
(ADDITIONAL INFORMATION ON REVERSE SIDE)
HOW TO CHECK OUT OF THE
MECHANICAL ENGINEERING GRADUATE PROGRAM

Please do not wait until the last minute to check out. Allow time to schedule an interview with all appropriate people listed on the front of this form. Also, the University Office of Global Programs (410 Boucke) has asked us to remind international students that you must also “check out” with their office before leaving.

Keep in mind that many things may keep you from graduating. If you plan on leaving, take a minute to think – small things can become a big problem to take care of from an out-of-town, state or country location.

SOME THINGS THAT CAN KEEP YOU FROM GRADUATING
1. Any unpaid PSU parking fines.
2. Any unpaid library fines or unreturned books.
3. Any unpaid tuition debt (CRITICAL).
4. Any non-degree classes or transfer of credits that have not been officially transferred.
5. Any missing mandatory classes.
6. Failure to follow the graduate calendar and make submissions by deadline(s).
7. Failure to file your “intent to graduate” on time (as outlined on the graduate calendar).

NOTE: After you filed your intent to graduate, the Graduate Schools often calls the MNE graduate program office with problems that must be taken care of immediately. Please check your e-mail and mailbox regularly for messages.

YOUR FUTURE PLANS
☒ I have taken a full-time job in industry, government, or academics. (Provide additional information below)
☒ I plan to pursue additional graduate studies. (Provide additional information below)
☒ My immediate plans are uncertain at the present time. Comments:

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<td>Department</td>
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<td>Street address</td>
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<td>E-mail address</td>
<td>City, State, Zip Code</td>
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<td></td>
<td>Telephone number</td>
</tr>
</tbody>
</table>
Exit Interview Evaluation Form

DATE OF INTERVIEW______________________________

Please use a numerical rating (0-4 scale; A=4; B=3; etc.) for the following:

**PLEASE RATE ME COURSES ONLY**

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<th>ME COURSE NUMBER</th>
<th>NAME OF COURSE</th>
<th>INSTRUCTOR</th>
<th>COURSE RATING</th>
<th>INSTRUCTOR RATING</th>
<th>COMMENTS</th>
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Degree (M.S.) Option: □ Thesis  □ Paper

Thesis Advisor:_________________________ Rating of Advisor:_________________

Comments on Thesis Advisor:

Comments on MNE Graduate Program:
Section D – Doctor of Philosophy Degree Program

MECHANICAL ENGINEERING CANDIDACY EXAM

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 examination must be taken within three semesters of entry into the doctoral program (summer sessions do not count);
- at least 18 credits must be earned in graduate courses beyond baccalaureate (but not necessarily at Penn State) before taking the examination;
- 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 Department strongly encourages students to take the candidacy examination at the earliest possible time.

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.

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.


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

**Rigid Body Mechanics**
Topics may include:
- Dynamics of particles and rigid bodies.
- Analysis of position, velocity, forces, and acceleration of particles, links, gears, cams, mechanism trains, or other linkage systems.

*Kinematics and Dynamics of Machinery*, Wilson, Sadler and Michels, Harper & Row

*Recommended Courses:* EMch 12, 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/)]

- **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.

*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.


**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.

DOCTORAL COMMITTEE

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 to the Department Head for approval through the MNE Graduate Programs Office. The Department Head 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.

**COLLOQUIUM REQUIREMENTS**

All students must successfully complete two credits of ME 590 Colloquium, preferably in their first two semesters in the program. These two credits may be satisfied during completion of an M.S. degree granted from this Department.

**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.
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.
**THESIS GUIDE**


**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/](http://www.gradschool.psu.edu/current-students/etd/thesisdissertationperformance-calendar/).
Ph.D. Thesis:

Fa15  Deadline to file intent to graduate on eLion – September 8, 2015
Mandatory format review, Thesis Office – October 5, 2015
Last date to pass Final Oral Doctoral Exam – October 16, 2015
Last date to submit final thesis to Thesis Office – November 20, 2015

Sp16  Deadline to file intent to graduate on eLion – January 25, 2016
Mandatory format review, Thesis Office – February 15, 2016
Last date to pass Final Oral Doctoral Exam – March 4, 2016
Last date to submit final thesis to Thesis Office – April 4, 2016

Su16  Deadline to file intent to graduate on eLion – third week of June 2016 (tentative)
Mandatory format review, Thesis Office – second week of June 2016 (tentative)
Last date to pass Final Oral Doctoral Exam – third week of June 2016 (tentative)
Last date to submit final thesis to Thesis Office – third week of July 2016 (tentative)

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 per below.

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.
GRADUATE STUDENT CHECK-OUT SHEET

Mechanical Engineering graduate students should follow the procedure listed below before leaving the University to ensure that they are in good standing at the time of their departure. The procedure consists of obtaining the signature of the following individuals, ascertaining that the student has fulfilled all obligations in the MNE Department. This form should be returned to the MNE Graduate Program Office to be included with your permanent file.

Student’s Name ___________________________ Date _________________

Thesis Status: Complete / Incomplete
(Circle One)

Graduation Date _________________ Have you filed your intent to graduate? __________

The student named above has fulfilled all obligations in the following areas:

<table>
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<tr>
<th>Number</th>
<th>Requirement</th>
<th>Signature</th>
<th>Date</th>
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<td>2.</td>
<td>Instrument Room (equipment returned)</td>
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<td>Budget Administrative Assistant:</td>
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<td>5.</td>
<td>Advisor:</td>
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<td>• Oral presentation of thesis</td>
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<td>• Name removed from computer accounts</td>
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<td>• All borrowed equipment returned</td>
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<td>• Laboratory cleaned up</td>
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<td>• Arrangements made for completion of thesis, etc.</td>
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<td>6.</td>
<td>Associate Head:</td>
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<td>• Certification of all degree requirements and transmission of information to the Graduate School</td>
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<td>7.</td>
<td>Personal interview with Associate Head:</td>
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<td>(Schedule with MNE Graduate Program Staff at least 7 days in advance)</td>
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AFTER ALL SIGNATURES ARE OBTAINED, RETURN THIS FORM TO THE MNE GRADUATE PROGRAM OFFICE, 127 REBER BLDG.
(ADDITIONAL INFORMATION ON REVERSE SIDE)
HOW TO CHECK OUT OF THE
MECHANICAL ENGINEERING GRADUATE PROGRAM

Please do not wait until the last minute to check out. Allow time to schedule an interview with all appropriate people listed on the front of this form. Also, the Office of International Students and Scholars (222 Boucke) has asked us to remind international students that you must also “check out” with their office before leaving.

Keep in mind that many things may keep you from graduating. If you plan on leaving, take a minute to think – small things can become a big problem to take care of from an out-of-town, state or country location.

SOME THINGS THAT CAN KEEP YOU FROM GRADUATING
1. Any unpaid PSU parking fines.
2. Any unpaid library fines or unreturned books.
3. Any unpaid tuition debt (CRITICAL).
4. Any non-degree classes or transfer of credits that have not been officially transferred.
5. Any missing mandatory classes.
6. Failure to follow the graduate calendar and make submissions by deadline(s).
7. Failure to file your “intent to graduate” on time (as outlined on the graduate calendar).

NOTE: After you file your intent to graduate, the Graduate Schools often calls the MNE graduate program office with problems that must be taken care of immediately. Please check your e-mail and mailbox regularly for messages.

YOUR FUTURE PLANS
☐ I have taken a full-time job in industry, government, or academics. (Provide additional information below)
☐ I plan to pursue additional graduate studies. (Provide additional information below)
☐ My immediate plans are uncertain at the present time. Comments:

New Permanent Address

Employer/Graduate School

Street address

Employer or Institution

City, State, Zip Code

Department

Telephone number

Street address

E-mail address

City, State, Zip Code

Telephone number
DATE OF INTERVIEW __________________________

Please use a numerical rating (0-4 scale; A=4; B=3; etc.) for the following:

**PLEASE RATE M.E. COURSES ONLY**

<table>
<thead>
<tr>
<th>ME COURSE NUMBER</th>
<th>NAME OF COURSE</th>
<th>INSTRUCTOR</th>
<th>COURSE RATING</th>
<th>INSTRUCTOR RATING</th>
<th>COMMENTS</th>
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Degree (Ph.D.)

Thesis Advisor: _________________________ Rating of Advisor: _________________________

Comments on Thesis Advisor:

Comments on MNE Graduate Program:
Section E – Graduate Core Courses, Schedule of Courses and Faculty Research Interests

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.

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

MATHEMATICS REQUIREMENT

Please refer to Section C of this Handbook for a listing of acceptable courses which fulfill the mathematics requirement for the MS degree.
**SCHEDULE OF COURSES**

The course schedule can be found at the Registrar’s website: [http://www.registrar.psu.edu/](http://www.registrar.psu.edu/) by clicking on “Schedule of Courses” at the top of the page and selecting the desired semester. The Schedule of Courses lists schedule number, number of credits, course title/description, instructor, meeting times, and other pertinent information. Students can enroll in courses on eLion ([https://elion.psu.edu/](https://elion.psu.edu/)).

**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/](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.
Section F - 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.

1) During the first year of enrollment, all graduate students will be required to complete an online RCR training program provided by the Collaborative Institutional Training Initiative (CITI). The Office for Research Protections (ORP) will provide the link to this training via the SARI Resource Portal on the ORP website (http://www.research.psu.edu/orp/sari/). Graduate students will also be required to engage in an additional five hours of discussion-based RCR education prior to degree completion. These discussions will encompass both universal and discipline-specific material.

Effective Fall 2015, all incoming students are required to complete both SARI and CITI during the first two semesters of enrollment.

On-line training

Starting in Fall 2009, all new graduate students in MNE will be 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. Students will print out these certificates and submit them to the MNE graduate office. Failure to comply will preclude certification for graduation by the Department. Special exemptions may be granted for timing of completion, but all students must ultimately complete the on-line training.

Discussion-based training

Starting in Fall 2009, all new graduate students in MNE will be required to complete five hours of discussion-based SARI education. Compliance will be monitored by certificates issued to each student at each training event. Students will print out these certificates and submit them to the MNE graduate office. Failure to comply will preclude certification for graduation by the Department.

The five hours should consist of:

a) one or more hours as part of the MNE graduate seminar series
b) one to five hours provided on Angel under SARI Training, or
c) two hours provided by various ORP offerings (brown-bag seminars, special workshops).

The typical format for MNE, COE or ORP offerings will include short introductory lectures and/or case study presentations with breakout sessions either with the entire class, in small groups or in pairs; and a final closing session to summarize findings and opinions.
A non-comprehensive list of potential topics is provided below.

- Acquisition, management, sharing, and ownership of data
- Publication practices and responsible authorship
- Conflict of interest and commitment
- Research misconduct
- Professional and research ethics
- Peer review
- Mentor/trainee responsibilities
- Collaborative science
- Human subjects protections
- Government/industry interactions
- Lobbying
- Resisting political pressure over technical decisions
- Technology transfer
- ITAR requirements
- Globalization/cultural perspectives
- Bio-ethics
Section G – Safety Information

INTRODUCTION
The objective of any safety program is to provide a safe working environment in which the hazards to all personnel are minimized. To accomplish this goal, safety must be the concern of all members of the institution. Suitable procedures must be devised and followed where potential hazards exist. Common sense must be relied upon to avoid accidents, and expedience is never an excuse for unsafe activities. In the following pages, the safety regulations and procedures for the MNE Department are outlined. These procedures should be followed to ensure a safe environment for all our students, faculty and staff. Safety in our teaching and research laboratories is a direct responsibility of the faculty, staff and graduate assistants concerned with such activities.

SAFETY REGULATIONS
Posted in the Instrument Room and on the bulletin boards are the University instructions regarding accidents. These instructions include the appropriate telephone numbers and procedures to follow in case of an accident. In addition, all accidents must be reported to the Department Head's Office (137 Reber Bldg.) as soon as possible. In the case of any injury, please complete an injury report, which can be obtained from boxes located near the Instrument Room (23 Reber) and the Machine Shop area. Failure to follow established Departmental safety procedures is considered to be a very serious matter and will be dealt with by the Head of the Department directly.

Employees are expected to work in a safe manner, using common sense to avoid accidents. Urgency of completing a test or the use of "expedient" procedures or equipment are not excuses for taking chances in the laboratory with unsafe conditions. However, even in situations where conscientious attention to safety is the rule, accidents can occur. When an accident does occur, it is vital to follow established procedures which will insure the safety of all personnel involved. Once these procedures have been followed, proper reporting of the accident to departmental personnel should follow. Please note that failure to follow the safety rules will result in machine shop privileges be suspended or revoked. The first warning will be verbal, the second warning will be a 30 day suspension and the third warning will result in permanent suspension.

The following safety precautions are particularly important to our operation:

1. An individual is not permitted to work alone at a potentially hazardous task. For example, graduate students or staff are not allowed to operate power tools or similarly dangerous equipment at night unless someone else is in the area.

2. Safety glasses or face shields are available at the Instrument Room. Wear them when operating power tools, around glass that might shatter, when using compressed gases, working on pressure line connections, etc. Safety glasses are mandatory and must be worn at all times in laboratories.

3. Around electrical equipment, avoid chances of grounding one part of your body while using your hands near "hot" lines. "One hand in the pocket" is a good rule. Don't experiment with circuits you don't understand.

4. Accumulation of fumes from volatiles, such as gasoline, is a great hazard -- use proper ventilation.
5. Handling of compressed gas cylinders should be done with the respect afforded any potentially explosive material.

6. Storage of chemicals is not allowed in refrigerators unless the refrigerator is marked suitable for chemicals.

7. Proper attire must be worn when operating equipment - no open-toed shoes or shorts can be worn in the machine shops or when running power tools. The use of cell phones or texting on cell phones is prohibited while operating equipment.

These items by no means cover all the problem areas; they do serve as examples.

Experimental set-ups of a potentially dangerous nature (explosion, high-voltage, etc.) are not to be operated until inspected and approved by your advisor.

**SAFETY IN THE LABORATORY**

**A. Undergraduates in the Laboratory**

With the number of students approaching 600 or more each year, the introduction of new laboratory projects and exercises results in increased chances of accidents in the laboratory. It is the direct responsibility of each faculty member or teaching assistant concerned with laboratory work to:

1. Take every safety precaution in designing and directing laboratory work.
2. Continually observe students in action and to watch for unsafe practices and unsafe equipment.

Some examples of hazards are:

1. High voltages.
2. Eye hazards such as chemicals, compressed air or steam leaks, chipping and hammering. Safety glasses are required.
3. Moving machine parts, such as unguarded couplings or shaft ends that could snag clothing.
4. Smoking with volatile, combustible liquids or gases nearby. Smoking is prohibited in all University buildings.
5. Compressed gas cylinders.

**B. Graduate Students in the Laboratory**

The MNE Department has a large research program which involves a wide variety of sophisticated equipment and apparatus. Some of these research activities involve potentially hazardous situations and require specific procedures for safe operation. Examples of such research areas include those involving combustion, laser diagnostics, solid propellants, high temperature and pressure conditions, etc.

It is the direct responsibility of each faculty member and graduate research student to ensure that safe procedures are observed in the laboratories. This includes:

1. Taking appropriate safety precautions in the design and operation of each experiment.
2. Assuring that students and staff engaged in operating equipment are familiar with its operation and potential hazards.

3. Providing that appropriate safety equipment is available in the laboratory. For example, safety glasses, respirators if required, etc.

4. Where appropriate, start up, shut down, and emergency shut-down procedures should be developed.

5. Assuring that students are familiar with University and Departmental safety and accident procedures. There should be safety manuals in each laboratory.

**SPECIFIC LABORATORY SAFETY PROCEDURES**

**A. Shop Safety and Proper Use of Machines**

Power tools can cause injury if precautions are not taken. The tools in the Instrument Room are there for your use. It is expected that students will follow safe shop practices when using them.

Some basic procedures to follow to prevent abuse of the machines and possibly yourself are:

1. Safety Goggles - Must be worn when operating any power tool. Also, when hammering or using a punch, chips can fly off these tools. Goggles are available from the Instrument Room.

2. When operating any power tool, jewelry, such as rings, bracelets, earrings, etc., should be removed.

3. Individuals who have long hair should use a hair net or other suitable means to prevent hair from being caught while operating any power tools. Tie long hair in a ponytail and tuck inside of shirt.

4. Drill press - Material being drilled should be secured to the table using a drill vise or other suitable clamping arrangement. Wear goggles; drill bits can shatter. Be especially careful when drilling sheet metal or any thin material. Drill bits frequently grab the material when the bit "breaks through." This will instantly spin the work piece.

5. Bandsaw - The bandsaw is equipped with a multi-purpose blade. It can be used for wood, plastic, and metal. Avoid cutting sheet metal; it tends to grab the teeth on the blade, removing them in short order. Never push a work piece with your hand or fingers in the same plane as the blade. Should your hand slip, you may find yourself cutting your hand or fingers. Always adjust the blade guide so it is just above your work piece. This keeps the blade in alignment and vertical. The blade may come off its rollers if this isn't done.

6. Grinder - ALWAYS wear goggles. Never stand directly in front of the wheel; your piece can be grabbed or thrown by the wheel, often quite violently. Also, never grind wood, aluminum, or other soft metals or plastics on a grinder. Particles of these materials become clogged in the wheel, ruining its effectiveness. Also, from a safety standpoint, this clogging can unbalance the wheel which could cause it to break, or more likely, explode, throwing pieces in the direction of the operator. Similarly, do not grind on the side of the wheel; the sideways stress can shatter the wheel.

7. General - Be courteous and professional. Horseplay doesn't belong around power tools; someone could fall into the machine and the distraction could cause another to have an accident, etc.

Also, clean up after yourself when you are done. The debris left behind could lead to an accident.
B. Laser Safety

Lasers are utilized in a variety of research programs within the Department, and when operated in a proper manner they do not pose a significant safety hazard. However, if operated improperly, they can pose significant electrical hazards as well as obvious hazards to eyesight. The following guidelines should be used when operating any laser system:

1. Do not attempt to use any laser unless you are familiar with its operation and potential hazards.
2. Where appropriate, use laser safety goggles designed for the wavelength and power output of that laser.
3. Never override the safety interlocks intended to prevent operation of the laser. For example, most laser systems prevent operation with the cover off the power supply or laser cavity.
4. When optical elements such as lens, prisms, etc., are used with the laser, be careful about spectrally reflected beams which result at each surface. These should be blocked to prevent personnel in the lab from potential hazards from reflected beams.
5. Never look directly into the laser beam. There is a laser safety course through EHS.

C. Compressed Gas Cylinders

1. General Use

Compressed gas cylinders are safe for the purpose for which they are intended. Serious accidents connected with their handling, use and storage can almost invariably be traced to abuse or mishandling. The following rules cover the main safety rules to be observed in handling compressed gas cylinders. Information specific to certain gases follows.

a. Compressed gas cylinders should always be moved using a cylinder cart. A cylinder cart is provided for that purpose next to the instrument room. The cart must be returned to that area immediately upon completion of the transfer.

b. All compressed gas cylinders should be securely chained and stored only in approved areas.

c. Where caps are provided for valve protection, such caps should be kept on cylinders except when cylinders are in use.

d. Do not drop cylinders or permit them to strike each other violently.

e. Make sure the regulator to be used is appropriate for the gas and cylinder pressure. Regulators or pressure gauges provided for use with a particular gas must not be used on cylinders containing different gases. Make sure that the threads on the regulator or other union are the same as those on cylinder valve outlet. Never force connections that do not fit or tamper with safety devices on valves, cylinders or regulators.

f. After attaching the regulator and before the cylinder valve is opened, see that adjusting screw of the regulator is released. Open the cylinder valve slowly; never permit gas to enter the regulator suddenly.

g. Before the regulator is removed from cylinder, close the cylinder valve and release all gas from the regulator.

h. Never store cylinders near highly flammable substances, such as oil, gasoline, etc.
i. All cylinders should be protected against excessive rise of temperature. Cylinders may be stored in the open, but in such cases should be protected against extremes of weather (ice, snow, direct sunlight in summer, radiators or open flames, etc.).

j. Store full and empty cylinders apart to avoid confusion. When returning empty cylinders, provide documents, as required. Close the valve and see that the protective caps and nuts for valve outlets are replaced before shipping empties.

k. Never attempt to mix gases in a cylinder.

2. Oxygen Use
   a. Never permit oil and greases to come in contact with oxygen cylinders, valve regulators, gauges and fittings. This is an explosive mixture.
   b. Do not handle oxygen cylinders or apparatus with oily hands or gloves.
   c. Never use oxygen from a cylinder without reducing the pressure through a suitable regulator intended for that purpose.
   d. After removing the valve cap, open the valve an instant to clear the opening of particles of dust or dirt.
   e. If the valve is difficult to open, point the valve opening away from you and use greater force. Avoid the use of a wrench on valves equipped with hand wheels.
   f. After attaching the regulator and before the cylinder valve is opened, see that the adjusting screw of the regulator is released.
   g. Never permit oxygen to enter the regulator suddenly. Open the cylinder valve slowly.
   h. Before the regulator is removed from the cylinder, close the cylinder valve and release all gas from the regulator.
   i. Avoid sparks or flame from welding or cutting torch from coming in contact with cylinders.
   j. Never interchange oxygen regulators, hose, or other appliances with similar equipment intended for use with other gases.
   k. Where oxygen cylinders are connected to manifolds or headers, such manifolds must be of proper design and equipped with one or more pressure regulators. Oxygen manufacturers will be glad to furnish specifications for construction and installation of proper oxygen manifolds and pipelines.
   l. Fully open the cylinder valve when the cylinder is in use.
   m. Never attempt to mix gases in an oxygen cylinder.
   n. Never use oxygen as a substitute for compressed air. It is dangerous to use oxygen for pneumatic tools, to start Diesel engines, for imposing pressure in oil reservoirs, for paint spraying, for blowing out pipelines, etc.
   o. Do not store cylinders near inflammable material, especially oil, grease, or any substance likely to cause or accelerate fire. Oxygen is not flammable, but supports combustion.
   p. Do not store reserve stocks of cylinders containing oxygen with reserve stocks of cylinders containing combustible gases. They should be separately grouped.
3. Acetylene Use

a. Acetylene cylinders should be used and stored in an upright position to avoid possibility of drawing out acetone.

b. Acetylene should never be used at a pressure exceeding 15 psi.

c. Keep sparks and flame away from acetylene cylinders.

d. Never use acetylene from cylinders through torches or other devices equipped with shut-off valves on the acetylene supply connections without reducing the pressure through a suitable regulator attached to the cylinder valve.

e. After removing the valve cap, open valve an instant to clear opening of particles of dust or dirt.

f. After attaching the regulator and before the cylinder valve is opened, see that the adjusting screw of the regulator is released.

g. Before the regulator is removed from a cylinder, close the cylinder valve and release all gas from the regulator.

h. Never interchange acetylene regulators, hose, or other appliances with similar equipment intended to be used with other gases.

i. Never attempt to transfer acetylene from one cylinder to another nor to mix any other gas with it in the cylinder.

j. Never use manifolds for acetylene cylinders unless constructed upon the advice of a qualified acetylene engineer.

k. The wrench used for opening the cylinder valve should always be kept on the valve spindle when the cylinder is in use.

l. When returning empty cylinders, see that valves are closed to prevent evaporation of acetone.

m. Never under any circumstances, attempt to refill an acetylene cylinder.

n. The pressure in an acetylene cylinder does not accurately indicate the amount of gas contained therein. The amount is determined by weight.

o. Never test for acetylene leaks with an open flame. Use soapy water.

p. Do not store reserve stocks of cylinders containing acetylene with reserve stocks of cylinders containing oxygen. They should be separately grouped.

4. Combustible Gas Use

Examples include Blaugas, Butane, Calorene, Carbo-Hydrogen, Compressed Natural Gas, Hydrogen, Nugas, Pintsch Gas, Propane, Pyrogen, Thermoline, etc.

a. Keep sparks and flames away from cylinders.

b. Connections to piping, regulators, and other appliances should always be kept tight to prevent leakage.

c. Never use an open flame to detect combustible gas leaks.

d. When cylinders are not in use, keep valves tightly closed.
e. Never use combustible gases from cylinders without reducing the pressure through a suitable regulator attached directly to the cylinder.

f. After removing the valve cap, open the valve an instant to clear the opening of particles of dust or dirt.

g. If the valve is difficult to open, point the valve opening away from you and use greater force. Avoid, however, the use of a wrench on valves equipped with hand wheels.

h. After attaching the regulator and before opening the cylinder valve, see that the adjusting screw of regulator is released.

i. Never permit the gas to enter the regulator suddenly. Open the cylinder valve slowly.

j. Before a regulator is removed from a cylinder, close the cylinder valve and release all gas from the regulator.

k. Manifolds for combustible gases should be used only if they are designed by qualified engineers. Gas manufacturers will furnish specifications for construction and installation of suitable manifolds.

l. Never interchange combustible gas regulators, hose, or other appliances with similar equipment intended for use with other gases.

m. Store all cylinders containing combustible gases in a well-ventilated place.

n. Do not store reserve stocks of cylinders containing combustible gases with cylinders containing oxygen. They should be separately grouped.

5. **Summary**

Though they are somewhat similar to the preceding rules, the following procedures given by the U.S. Department of Labor are more specific on some points:

Cylinders containing compressed gases should be examined upon receipt. If they show signs of damage or leakage, they should be moved to a safe area and be returned to the supplier as soon as possible. Great care is needed in handling all cylinders. They must not be dropped or bumped against each other, and other objects must not be allowed to fall on them. They should be stored and used in safe areas where they will be protected against falling objects, removed from any source of heat, and from electrical wiring. Cylinders intended for use from an upright position should always be stored and used in an upright position and secured by chain, cable, or other suitable means to prevent their falling over.

Most cylinders are provided with a steel protective cap that screws on over the valve. These caps should be kept in place at all times except when cylinders are in use.

A safe means of handling must be devised in order to avoid rough treatment while they are being transported. This would include providing special hand trucks, substantial racks or platforms with guard rails for vertical lifting by mechanical means, or other safety devices. When transported in motor vehicle, they should be fastened inside the body of the truck to reduce the possibility of being struck in the even to a traffic accident. Cylinders should not be lifted more than one at a time in slings and they should never be lifted by the valve protection cap.

Storage areas should be in fire-resistant structures, and should be kept clean, free of combustible materials, well-lighted, and well-ventilated. Cylinders of oxygen should not be stored near cylinders containing flammable gases. If they have to be stored in the same area, they should be separated by a fire-resistant wall. Empty cylinders should be so marked and kept separate from the full ones.
Cylinders should be positively identified as to the gases they contain. When a cylinder is empty, no attempt should be made to fill it with another kind of gas. Gases should never be mixed in a cylinder.

D. Mercury Spills

The following steps should be taken in case of an accident involving mercury spill.

1. Do not attempt to clean the mercury in the contaminated area. Mercury breaks into tiny particles and further contaminates the area. Special equipment is needed to insure contamination is controlled.
2. Mark the contaminated area.
3. Do not walk on the contaminated area.
4. Turn on the air exhaust if available.
5. Leave the room immediately.
6. Contact the University Environmental Health and Safety Office immediately (865-6391) and notify the Department Office as soon as possible.

E. Chemicals (EHS has a chemical safety course and uses CHIMS)

When using any chemicals, be sure that you are knowledgeable concerning their properties and hazards. Material Safety Data Sheets (MSDS) are available and should be read for all chemicals. The University Environment Health and Safety Office (865-6391) has a large collection of MSDS and should be contacted for copies. Always wear safety glasses, and if appropriate, suitable gloves or other required clothing. Further general rules are:

1. Flammable liquid should be stored in and dispensed from approved safety containers and should be kept away from heat and open flames.
2. All chemicals should be stored in suitable cabinets.
3. Strong bases and acids which are supplied in glass bottles should be transported only in suitable bottles carriers (available in VWR chemistry stockroom in 125 Chemistry Building, 865-6171).
4. Smoking is not permitted anywhere in Reber Building or while handling chemicals or in storage areas containing chemicals.
5. Chemical storage areas, hoods and work space should be neat and well organized.
6. All containers containing chemicals must be labeled including waste materials.
7. Disposal of all chemicals should be done in a proper and safe manner. The University Safety Department should be consulted concerning proper disposal procedures.
8. The consumption of food and drinks is not permitted in chemical laboratory or storage areas.
9. If any spills or leaks (e.g. water) occur, please inform personnel in areas below or adjacent to the spill so that appropriate measures to protect personnel and equipment can be made.
F. Electrical Hazards

1. Only qualified personnel are allowed to work on electrical equipment or energized lines.
2. Sparks or smoke from a motor or other electrical equipment can mean a shock or fire hazard. Turn off the power at once and report the condition promptly.
3. Electrical equipment should not be operated in wet areas.
4. Electrical equipment possessing frayed or cracked cords should not be used until the cord is replaced.
5. Remove rings and jewelry which may result in electrical contact while working on electrical equipment.
**EMERGENCY TELEPHONE NUMBERS**

FIRE OR ACCIDENT - 911

POLICE SERVICES - 863-1111 or 911 for emergencies

AMBULANCE - 911 OR 863-1111

PHYSICAL PLANT (STEAM, ELECTRICITY, ETC.) - 865-4731

MNE. EMERGENCY CONTACTS:

Engineering Unit C, Hammond, Reber, University Support Building II: Karen A. Thole, 865-2519, KThole@psu.edu, 137 Reber Building, Matthew Zerphy, 863-6381 or Wayne Royer - 863-5702 132 Reber Building.

Leonhard Building: Cindy Winkelblech, 863-6380, ckb2@engr.psu.edu or Becky Benson, 865-6492, rle4@psu.edu, 314 Leonhard Building

Research West: Michael Barringer, 867-1450, mdb22@psu.edu

Research Building East and High Pressure Combustion Lab: Eric Boyer, 863-6274, jeb19@psu.edu, 137 Research Building East

1. **College of Engineering Safety Officer**

   Clark W. Colborn 865-7137

2. **Contents of First Aid Kit**

   - Band Aid Adhesive Bandages
   - Adhesive Tape
   - Anti-bacterial Cleaning Wipes
   - 1 in. Bandage (Roll)
   - 2 in. Bandage (Roll)
   - 8 ply Gauze
   - Sterile Gauze Pads
   - Tweezers
   - Ammonia Inhalants
   - Triangular Bandage
   - Eye Pads
   - Scissors
   - First Aid Book
   - Foile Ointment for minor burns
   - Merthiolate Tincture

3. **First Aid Supplies Are Located in the Following Rooms and Areas**

   - 25 Reber - Mechanical Engineering Shop
   - 23 Reber - Instrument Room (2 boxes)
   - 137 Reber - MNE Office
EMERGENCY PROCEDURES

IN CASE OF FIRE:

Pull the fire alarm.
· Leave the building immediately using the closest emergency exit.
· Close doors behind you (DO NOT LOCK).
· Call 911 or 814-863-1111 when safe to do so.
· Move to a safe location away from buildings or to your buildings Designated Meeting Site.
· Re-enter the building only when instructed by Designated Public Safety Official(s).
· Do not assume an alarm is false.
· Do not use elevators.
· If unable to exit the building, go to the nearest exit stairwell or assisted evacuation staging area and call 911 or 814-863-1111 to report your location.
· If trained, use a fire extinguisher if the fire is small and contained and room is not filled with smoke.
· Portable fire extinguishers are provided, but it is NOT the responsibility of building occupants to perform fire suppression activities. Only trained individuals should attempt to use an extinguisher. Those that choose to use an extinguisher do so at their own risk.

IN CASE OF GAS LEAK/ODOR:

If you smell natural Gas:

· Leave the building and go to an area where the gas is not present.
· Call 9-1-1.
· Provide the necessary information to the dispatchers.
· Provide as much detail as possible.

For more information about this subject please contact Environmental Health and Safety at 814-865-6391.

IN CASE OF A TELEPHONE BOMB THREAT:

Stay calm and obtain as much information as possible from the caller and report the threat immediately to 911 or 814-863-1111.

Be sure to note:
· Precise time of the call.
· Caller’s exact words.
· Noticeable characteristics of the caller (gender, age, calm/angry, excited/slow, etc.).
· Information regarding the device and possible location.
· Background sounds (machine, voices, street noises, music, etc.).
· Threat language (well spoken, taped, irrational, foul, incoherent, etc.).
Ask the person questions, such as:
- Where is the bomb located?
- When will the bomb explode?
- What does the bomb look like?
- What kind of bomb is it?
- What will cause the bomb to explode?

PERSONAL SAFETY TIPS:
· Do not let people into a locked building or office unless you work with them or they have been properly identified. If the person gives you any problems, call the police.
· In the event that a suspicious person is seen roaming around or suspicious calls are received, contact police.
· Always keep the door to your room locked when you are working alone.
· Don’t investigate a suspicious person or noise outside by yourself.
· Keep a list of emergency numbers with you.
· Never walk alone at night. Walk in an alert confident manner and actively pay attention to your surroundings.
· Choose the best lit, most traveled paths when walking.
· Take a self-defense course.

MECHANICAL & NUCLEAR ENGINEERING EMERGENCY CONTACT
Matthew Zerphy - 863-6381 or Wayne Royer – 863-5702 - 132 REBER BUILDING
Section H - Frequently Asked Questions

How do I find an advisor?
You indeed have raised a difficult question, for which there is no single answer. Perhaps most appropriate is for you to define your area or areas of interest: such as the broad areas of mechanical versus thermal systems. What undergraduate courses were most appealing? Thermodynamics/fluid mechanics/heat transfer area or the kinematics/dynamics/controls area? From these, you may want to look at the various areas of research conducted in our department that links to your educational interests. You should then communicate directly to the faculty members who conduct research in an area of your interest to find about what opportunities he/she may have available.

What courses are required for an M.S. degree?
You are required to complete 30 graduate credits of which 18 must be at the 500 and 600 level. Up to 12 credits (4 courses) of certain 400-level courses are allowed. For the new graduate student, it is very important that you schedule a meeting with your advisor to discuss and to formulate a course program prior to the start of the M.S. program. If you do not have one prior to your arrival to Penn State, the MNE Associate Head of Graduate Programs will act as your temporary advisor. In general, the course offerings change only to a limited extent from one academic year to the next. Similarly, the course offerings for a particular semester (e.g., the Fall Semester) usually do not change much from one year to the next. See Section E for some guidance.

How many graduate-level courses should I take per semester?
For students beginning their first semester, 3 courses at the 500-level are very time-consuming. Very few are capable of taking a total of 12 credits of courses in one semester. Since many students have an assistantship, it is also important that the duties associated with the assistantship are carried out satisfactorily.

What courses will satisfy the Math requirement for the M.S. degree?
Please refer to Section C for courses which will satisfy the mathematics requirement.

How long will it take to complete an M.S. degree?
The average time to complete an M.S. degree is about two years, though some may take longer. Most students that start in the Fall finish in May 21 months later.

What kind of M.S. thesis options do you have?
We have two options, although a third is possible for Ph.D. students. For students whose interest is to terminate the graduate studies with the M.S. degree, there is either the M.S. thesis or M.S. paper option. Most students choose the thesis option, because one less course is required.

What is the difference between an M.S. thesis and an M.S. paper option?
There is, in general, not a significant difference between the M.S. thesis and the M.S. paper options. Both require the completion of 30 graduate credits. The thesis involves 6 credits and it must be prepared according to procedures and guidelines specified by the Graduate School. In the M.S. paper option, the students write a paper on a research topic agreed upon by the advisor that should be publishable in a professional journal or presented at a national or international conference.
What job opportunities become available once receiving an M.S. degree?

One would expect that the job opportunities are different with an increased depth of knowledge of the fundamentals, research experience and improved technical writing skills. It is anticipated that the students’ job could involve solving more complex problems in design and manufacturing, as well as involving a larger part of management responsibility.

What kind of facilities do you have for preparation of theses and technical papers?

There are PCs in the Department as well as at other locations within the University to which the students have access. These computers are loaded with the latest versions of various popular word-processing packages. You also have been allocated $15/semester towards printing on either B&W or color printers.

What courses are required for a Ph.D. degree?

There is no formal course program required for the Ph.D. degree. However, the advisor and members of the student's Ph.D. committee normally decide the content of the course program. About 14-18 courses beyond the B.S. degree are typical. No courses can be transferred to the Ph.D. program from another university.

How long will it take to complete a Ph.D. degree?

It varies considerably. If the student has completed an M.S. degree, it may take only 3 years. However, if the student has a B.S. degree, it may take 5-7 years.

What course material should be reviewed for the Ph.D. candidacy exam?

It is generally useful that the student reviews material covered in various undergraduate courses such as thermodynamics, fluid mechanics, heat transfer, solid mechanics, rigid body mechanical systems, and systems dynamics. The material covered on the candidacy exam is based on the baccalaureate degree; however, it requires the student's understanding, competency and maturity acquired in graduate study. The student should consult his/her advisor as well as the Graduate Student Handbook.

What job opportunities become available once receiving a Ph.D. degree?

Today, most of our students find a position in industry with job responsibilities associated with research and development. Others find a research position at a national laboratory, such as National Institute of Standards and Technology (NIST), Sandia National Laboratories, Naval Research Laboratory, etc. These positions are often of a temporary nature (post-docs), and often spanning about two years. A few find an academic position as a tenure-track assistant professor, but the competition is keen.

What are the duties of the "typical" Teaching Assistant?

The "typical" teaching assistant serves as grader for a lecture course having between 50-100 students. The TA also keeps office hours, proctors exams and may give recitation sessions.

What possibilities of teaching do I have as a Teaching Assistant?

The opportunity to teach a lecture course is very limited for graduate students in general. Most teaching assistants serve as a grader in courses, or may teach a laboratory course. During the past several years, teaching a lecture course has been one important aspect of the Graduate Teaching Fellow program. The students participating in this program are usually within a year from completion of their Ph.D. degree.
You have a Graduate Teaching Fellow program. What is that program about?

The Graduate Teaching Fellow (GTF) Program is designed for students who are seriously considering a career in academe. The program provides an opportunity to gain real-world university teaching experience and opportunities to learn more about an academic career. GTF's are assigned to teach regular undergraduate mechanical engineering courses and work with a faculty mentor. The fellow has the same academic freedom as a regular faculty member in structuring the course, and is responsible for the course syllabus, quizzes, and examinations, subject, of course, to maintaining appropriate commonality among sections in the same course, etc. The mentor provides guidance as desired by the fellow.

The second component of the program is the GTF Seminar Series. Within this series, University faculty members and administrators share their insights on a variety of topics. Topics include how faculty balance teaching, research, service, and family life; how to obtain research funding; how the tenure process works; how a major university is organized and the various services provided by faculty members; and others. The seminars are designed to permit frank and open discussion.

What are the possibilities for financial support?

About half of the students who arrive at Penn State at the beginning of the academic year have received either teaching or research assistantships covering tuition and a monthly stipend of approximately $2,000.00.

What is the typical teaching assistant stipend? What does it cover? What kind of taxes do you pay?

The teaching assistantship covers tuition and includes a monthly stipend of about $2,000.00. Students on assistantships must pay federal, state and local taxes. Taxation rates differ depending on the student’s local/home address. In other words, the rates of local taxation might be different depending on where the student lives. For example, a student living in the borough of State College may pay a different rate compared to a student living in a township. These taxes are deducted from the student’s monthly stipend. Fellowships, however, are non-taxable.

What research facilities are established in the Department?

A complete listing of labs and research facilities can be found at the MNE website (http://www.mne.psu.edu/).

What graduate-level courses are offered?

Please refer to the Schedule of Courses at the Registrar’s website: http://www.registrar.psu.edu/.

Some faculty members are always "out-of-office" or "never" answer the telephone. How should I most effectively contact them?

Our faculty members are very active in teaching, research, and various service activities. To attract their interest, it may be best to send an e-mail stating your educational background, and research interests and include a resume. If the faculty members have an interest, they will contact you. Please note that faculty members get hundreds of inquires every year, and it is very difficult to provide an individual reply to all requests. Please have understanding in this matter.
What can I do to improve my written and oral communication skills?

To enhance your written communication skills, you may wish to take various courses offered by the English Department (such as English 202C - Technical Writing and other developed for this purpose). To improve your oral communication skills, the Department of Speech Communication Arts & Sciences offers a wide variety of courses. International students, whose native tongue is not English, can enroll in English as a Second Language courses (ESL) offered through The Department of Applied Linguistics. [http://aplng.la.psu.edu/academicPrograms/eslProgram.shtml](http://aplng.la.psu.edu/academicPrograms/eslProgram.shtml). The Graduate Writing Center offers a variety of writing workshops throughout the year. For more information, please refer to the website: [http://composition.la.psu.edu/](http://composition.la.psu.edu/). MNE and other COE departments also sponsor communication workshops for graduate students which are taught by Dr. Michael Alley. For more information about College of Engineering writing workshops, please go to: [http://writing.engr.psu.edu/](http://writing.engr.psu.edu/).

What can I do to become an effective presenter of technical material?

To enhance your presentation skills, it may be useful to attend the large numbers of seminars that are held in Mechanical and Nuclear Engineering as well as in other departments. The Mechanical and Nuclear Engineering Department and individual faculty invite a large number of speakers every year, either as part of the Department Seminar Series (ME 590), hiring of new faculty, etc. Announcements are sent by e-mail to graduate students and are also posted on the MNE website. MNE and other COE departments also sponsor communication workshops for graduate students which are taught by Dr. Michael Alley. For more information about College of Engineering writing workshops, please go to: [http://writing.engr.psu.edu/](http://writing.engr.psu.edu/).

When are the various thesis deadlines?

The Graduate School specifies various deadlines for submitting draft and final versions of theses/dissertations. Check with our Graduate Program Office, 127 Reber Building, for Departmental deadlines. You may also refer to the Graduate Calendar at [http://www.gradschool.psu.edu/current-students/etd/thesisdissertationperformance-calendar/](http://www.gradschool.psu.edu/current-students/etd/thesisdissertationperformance-calendar/) for these deadlines.