

GRADUATE PROGRAM HANDBOOK

Department of Mechanical Engineering

The Pennsylvania State University

Mechanical Engineering Graduate Student Handbook

Academic Year 2020-2021



PennState
College of Engineering

**MECHANICAL
ENGINEERING**

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Special Considerations for 2020-2021: COVID-19

At the time of this writing, the University, College, and Department are establishing policies and procedures to deal with the pandemic. These are expected to evolve over the course of the year, and may supersede the information that is provided in this document. Students are encouraged to monitor regularly the information that is posted by the University at <https://virusinfo.psu.edu/> and by the Graduate School at <https://gradschool.psu.edu/covid19/>, and to contact the Graduate Programs Office in case of questions.

Section I – General Information for Graduate Students

GRADUATE PROGRAMS OFFICE

The Graduate Programs Office for Mechanical Engineering is located in 127 Reber Building. The office is supervised by the Associate Department Head for Graduate Programs, Dr. Dan Haworth. Graduate Program Coordinator, Rachel Reed, and Administrative Support Assistant, Ashley Ammerman, are available to assist students between the hours of 8:00 am - 5:00 pm on Mondays through Fridays.

General functions of the Graduate Programs Office are to:

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

The Graduate Programs Office is guided and assisted in these duties by several faculty committees including the Seminars and Graduate Policy Committee, the Graduate Admissions Committee, the Graduate Student Recruiting and Support Committee and the Ph.D. Qualifying Exam Committees. Committee members are appointed by the Department Head, Karen Thole.

ID CARDS

Every Penn State campus has an office that issues id+ cards. There is no charge for your first card.

When you come to the id+ Office, you will need to present a valid driver's license, passport, state-issued photo ID, military ID, government-issued photo ID, high school photo ID with a Social Security Card, college ID with a Social Security Card, or a Permanent Resident Card. Without one of these valid forms of ID, we cannot issue you an id+ card. Please note that you must be registered for at least one credit in order to be issued an ID card.

University Park ID+ Card Offices

20 HUB-Robeson Center
Phone: 814-865-7590
Email: idcard@psu.edu

PSU EMAIL

The Graduate Programs Office uses email to notify students of various announcements, events, etc. All graduate students are required to use their Penn State email account for all correspondence regarding your academics. If you choose to use an account other than the one provided, you are responsible for all information contained in your PSU account. Please refer to the Information Technology (IT) website for more information: <https://it.psu.edu/>.

Additionally, the ME Graduate Programs Office send emails as information becomes available which contains information about job opportunities, fellowships, university activities, workshops, etc.

MAIL HANDLING

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

PARKING

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

Parking registration must be completed [online](#). All permits are sold on a first come, first served basis. PermitDirect™ will provide a printable temporary permit allowing students to park immediately.

OFFICES, KEYS, TELEPHONES, SUPPLIES, AND COPIES

OFFICES - Students on teaching assistantships will be provided access to space so that they can carry out their responsibilities as teaching assistants. Students on research assistantships will be provided desk space by their research adviser.

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

PURCHASE OF EQUIPMENT AND SUPPLY ITEMS - Listed below is a brief overview. We stress that you ask 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 adviser 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 procedures with someone who knows the system before you order, and you will avoid complications.

COPY MACHINES – Copy machines are at various locations in Reber Building and in other buildings occupied by ME faculty and graduate students. Your graduate research adviser can provide authorization to access these copiers. If you are using these services for "non-personal" University-related work, ask your faculty supervisor about how to pay for them before you have the work done.

TRAVEL REIMBURSEMENTS

A student who participates in a conference or workshop may be reimbursed for expenses, if the student's adviser wishes to do so. The appropriate staff assistant or the Graduate Programs Office can provide you with the necessary reimbursement paperwork. If you make travel arrangements on your own with the intent of eventually charging a University budget and violate University policy, you may be personally liable for travel costs. Take time to review the procedures with someone who knows the system before you order, and you will avoid complications.

MECHANICAL ENGINEERING COMPUTER AND IT RESOURCES

ME students have access to departmental computer resources. Information will be forthcoming on the department web site. IT support is available at support@me.psu.edu.

Contact: Christopher Hirsh, IT Consultant, 201C Reber Building; Phone: 865-8267;
Email: cdh5049@psu.edu

Section II – General Administrative Procedures

Reporting Resources

All members of the Penn State community are asked to remain mindful of their individual commitment to Penn State's core values of [Integrity, Respect, Responsibility, Discovery](#).

[Excellence and Community](#) by helping to keep the University a safe and ethical institution. In addition, as members of this community, everyone should be responsible stewards of University funds, whether generated from state, federal, student, or other sources. The University does not condone wrongful conduct by any member of the Penn State community, no matter what position he or she may hold. Penn State University encourages the reporting of misconduct. **If you see something, say something.** If you report misconduct, be assured that the University will protect you from retaliation. See [AD67](#) or contact the [Office of Ethics & Compliance](#) for more information. The following resources are available for faculty, staff, students, and others:

TO MAKE A REPORT

A summary of types of misconduct and how to report is available at <http://reporting.psu.edu>.

If at any point you are unsure where to report a non-emergency, you may contact:

- The Office of Ethics and Compliance, Monday-Friday, 8am-5pm ET: **814-867-5088**
- The Penn State Hotline, 24/7: **800-560-1637** or <http://hotline.psu.edu>

Crime or Emergency situation

- Contact the campus police (814-863-1111)
- In an emergency, dial **911**

Penn State has established a [Responsible Action Protocol](#) in response to the University Park Undergraduate Association's campaign for a medical amnesty policy. Effective January 2018, the Responsible Action Protocol was updated and now reflects the following:

- A student who acts responsibly by notifying the appropriate authorities (e.g., calling 911, alerting a resident assistant, contacting police) AND meets one or more of the following criteria typically will not face University conduct action for his or her own use or possession of alcohol or drugs. However, the student will be required to attend an approved alcohol or drug education program, such as BASICS or the Marijuana Intervention Program (MIP); the fee will be waived. When the student's behavior involves other Code of Conduct violations (e.g., vandalism, assault, furnishing to minors) the additional behavior may be subject to conduct action. If a student exhibits a pattern of problematic behavior with alcohol or drugs, that student may be subject to conduct action.
- The criteria which invoke the Protocol are:
 - A student seeks medical assistance *for himself or herself* when experiencing an alcohol or drug overdose or related problems
 - A student seeks medical assistance *for a peer* suffering from an alcohol or drug overdose or related problems
 - A student suffering from an alcohol or drug overdose or related problems, *for whom another student seeks assistance* will also not be subject to conduct action for alcohol violations.

Suspected ethical or policy violations

(including fraud, theft, conflict of interest, abusive or intimidating behavior, retaliation, athletics integrity or NCAA compliance)

- Report employee misconduct to your supervisor or [HR Strategic Partner](#)
- Report student misconduct to the [Office of Student Conduct](#) or call **814-863-0342**

- Use the Penn State Hotline at [800-560-1637](tel:800-560-1637) or <http://hotline.psu.edu>. Both are anonymous and available 24/7

Child abuse, including child sexual abuse

- Contact the Pennsylvania Child Welfare Services "ChildLine" at [800-932-0313](tel:800-932-0313) or <https://www.compass.state.pa.us/cwis>
- If the child is in immediate danger, dial **911** first
- You must also email AD72@psu.edu communicating that a report has been made. For more information on AD72 (Reporting Suspected Child Abuse), see <https://guru.psu.edu/policies/AD72.html>
- Further details can be found in the "Building a Safe Penn State: Reporting Child Abuse" training available on the Learning Resource Network at <http://lrn.psu.edu>

Behavioral threat

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

Bias, discrimination, or harassment

- To report behavior *by an employee*, contact the Affirmative Action Office at [814-863-0471](tel:814-863-0471)
- Visit the Report Bias website: <http://equity.psu.edu/reportbias> (For student reporting only)
- Acts of intolerance by students may be reported to the [Office of Student Conduct](#) at **814-863-0342**

Sexual harassment and other forms of sexual misconduct**

To make a report to the University:

- Contact the University's Title IX Coordinator at **814-867-0099** or titleix@psu.edu.
- **To file an online report:** Visit the Office of Sexual Misconduct Prevention and Response's website at <http://titleix.psu.edu/filing-a-report/> to file an online report
- **To file an anonymous report:** The Penn State Hotline is available 24/7 at [800-560-1637](tel:800-560-1637) or <http://hotline.psu.edu>. Both are anonymous and available 24/7.

**** Additional information regarding information and resources available in relation to incidents of sexual harassment and/or misconduct (including a campus-specific list of victim support services and confidential reporting options) can be found at <http://titleix.psu.edu/>**

To file a discrimination or harassment complaint outside of the University:

- The Office for Civil Rights (Philadelphia Office) at [215-656-8541](tel:215-656-8541) or email OCR.Philadelphia@ed.gov
- The Equal Employment Opportunity Commission (Philadelphia District Office) at [800-669-4000](tel:800-669-4000)
- The Pennsylvania Human Relations Commission (Harrisburg Regional Office) at [717-787-9780](tel:717-787-9780)

Student misconduct

- Contact the Office of Student Conduct at **814-863-0342** or <http://studentaffairs.psu.edu/conduct> or report at https://pennstate.qualtrics.com/jfe/form/SV_8qYxyWYciWERPGI
- Hazing by any student organization or individual is against Penn State's code of conduct, and also a violation of Pennsylvania law. To report instances of hazing

within any student organization or group, including fraternities and sororities, contact the Office of Student Conduct (<http://studentaffairs.psu.edu/conduct> or **814-863-0342**) or the Penn State Hotline at **800-560-1637** or <http://hotline.psu.edu>

Research-related

- Any research-related concerns should be directed to the Office for Research Protections at **814-865-1775** or orp@psu.edu
- Research misconduct concerns should be directed to 814-865-1775 or researchconcerns@psu.edu

RESOURCES

- Policy AD88 - [Code of Responsible Conduct](#)
- By-laws of The Pennsylvania State University (section 8.13): <http://news.psu.edu/story/143476/2013/01/04/employees-reminded-disclose-conflicts-interest>
- Policy HR91 – Conflict of Interest: <https://guru.psu.edu/policies/OHR/hr91.html>
- Policy RP02 - Addressing Allegations of Research Misconduct: <https://guru.psu.edu/policies/RP02.html>
- Policy RP06 – Disclosure and Management of Significant Financial Interests: <https://guru.psu.edu/policies/RP06.html>
- Policy AD74 - Compliance with Clery Act: <https://policy.psu.edu/policies/ad74>
- Policy AD77 - Engaging in Outside Professional Activities (Conflict of Commitment): <http://guru.psu.edu/policies/AD77.html>
- Policy AD85 - Sexual and/or Gender-Based Harassment and Misconduct (including Sexual Harassment, Sexual Assault, Dating Violence, Stalking, and Related Inappropriate Conduct): <https://guru.psu.edu/policies/AD85.html>
- Policy AD86 – Acceptance of Gifts and Entertainment: <https://guru.psu.edu/policies/AD86.html>
- Policy AD91 - Discrimination and Harassment and Related Inappropriate Conduct: <https://guru.psu.edu/policies/AD91.html>

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

- Office of Human Resources Employee Relations Division at **814-865-1473** or <http://ohr.psu.edu/employee-relations/>
- Office of University Ethics and Compliance at **814-867-5088** or <http://www.universityethics.psu.edu/>
- Office of Affirmative Action at **814-863-0471** or <https://affirmativeaction.psu.edu/>
- Office of Sexual Misconduct Prevention and Response at **814-867-0099** or <https://titleix.psu.edu/>
- Office of Student Conduct at **814-863-0342** or <http://studentaffairs.psu.edu/conduct>
- Office of Internal Audit at **814-865-9596** or <http://www.internalaudit.psu.edu/>
- Clery Act Compliance Manager at **814-863-1273** or <http://www.police.psu.edu/clery/>
- Your campus, college, or unit's Human Resources [Strategic Partner](#). Contact information is available at <https://hr.psu.edu/content/hr-strategic-partner-and-consultant-directory>.

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. See <http://studentaffairs.psu.edu/counseling/>.

GRADUATE & PROFESSIONAL STUDENT ASSOCIATION (GPSA)

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

UNIVERSITY HEALTH SERVICES

The University Health Service is located in the Student Health Center, which is adjacent to the Eisenhower Parking Deck and the Bank of America Career Services Building off Bigler Road. Its facilities are available to all students, including graduate students at all levels of training. See <https://studentaffairs.psu.edu/health>.

HEALTH INSURANCE

Health insurance is mandatory for all Graduate Students, and students with a RA or TA appointment are automatically enrolled. As a Graduate Assistant or Graduate Fellow, you are eligible to receive subsidies for the Graduate Assistant and Graduate Fellow medical, dental and vision plans for you and any eligible dependents. Students enrolled in the University health insurance plan have their premiums automatically deducted from their paycheck.

Deadlines and policies are found at <https://studentaffairs.psu.edu/health>, or contact University Health Services directly at 814-862-0774 if you have and questions regarding Penn State Student Health insurance.

LionPATH

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

Consent to Do Business Electronically

The first-time students log in to LionPATH, they must sign the Consent to Do Business

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

Complete Pre-Registration Activity Guide and Financial Responsibility Agreement – Each Semester

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

ENROLLING IN CLASSES

Course Registration – All students must register for classes prior to the Late Registration period, which can be found at <http://www.registrar.psu.edu/academic-calendars/>. If you do not register before that date, you will be assessed a late-add fee and a late registration fee. If you are on a half-time graduate assistantship, you must register for 9-12 credits per semester. International students must be registered full-time, or for 9 credits, to maintain their visa status.

Incoming Students

Courses for the first semester will be selected after consultation with the ME Associate Department Head for Graduate Programs, unless a permanent adviser has already been selected. For lists of suggested courses in specific areas of interest, see SUGGESTED CORE COURSES below.

Enrolled Students

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

FULL-TIME ACADEMIC STATUS

Full-time academic status is achieved by taking appropriate course loads. Most loan-granting agencies and other organizations will consider a nine-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 <https://bulletins.psu.edu/graduate>.

TUITION BILLS

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

ACADEMIC ADVISER

Each graduate student will have an academic adviser 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 adviser. For doctoral students, the research adviser will be the academic adviser. The Associate Department Head for Graduate Programs will initially act as the temporary adviser for incoming graduate students. The student is responsible for obtaining a permanent academic adviser and designing a program of graduate study with the adviser.

Master's students with academic advisers who are not members of the Mechanical Engineering Graduate Faculty are required to have a co-adviser who is a member of the Mechanical Engineering Graduate Faculty.

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

OBLIGATIONS AND RESPONSIBILITIES OF GRADUATE STUDENTS

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

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

A. Privileges and Benefits

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

B. Obligations and Responsibilities

1. Maintain satisfactory scholarship.
2. Make progress in degree program acceptable to the Department and Graduate School.

3. Assume full responsibility for knowing the regulations and pertinent procedures of the Graduate School & Graduate Bulletin
<https://bulletins.psu.edu/graduate/programs/>.
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: <https://studentaffairs.psu.edu/conduct>.
6. Register for the appropriate number of courses/credits per semester.
7. Meet standards of the Department for behavior in the performance of assigned duties.
8. Exercise the privileges and obligations of academic freedom.

RESPONSIBILITIES OF RESEARCH AND TEACHING ASSISTANTS

Assistantships are contracts to provide services to the Department in research or teaching for which a stipend plus tuition coverage is received. Your specific duties will be assigned by the faculty member to whom you have been appointed. A half-time assistantship allows a student to schedule 9-12 credits per semester, receive a stipend plus grant-in-aid of resident education tuition and certain other benefits, and perform tasks that, on the average, occupy approximately 20 hours per week. Research duties often coincide with the student's graduate research that they perform to meet their degree requirements. 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 the Graduate School. Detailed information about eligibility and the procedure to apply is sent to all ME graduate students in late spring.

Teaching Assistants

Graduate students are eligible to apply for available teaching assistantships. 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. For international students to qualify, they must receive a satisfactory score on the AEOCPT test which is administered by the Department of Applied Linguistics.

Flex Teaching Assistants

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

Research Assistantships

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

INTERNATIONAL STUDENTS

In order for international students with student visas to maintain their visa status through Penn State, they must meet several obligations which are listed in detail on the Office of Global Programs website at: <https://global.psu.edu/category/international-students>.

Regardless of whether the international student is receiving or appointed on a graduate assistantship, they must maintain full-time academic status.

Graduate students will enroll for variable credits up to 12, with nine credits being the minimum required to fulfill Department of Homeland Security (DHS) visa requirements for full-time enrollment.

Exceptions to full-time study must be approved by the faculty adviser and department **in advance** by completing the [Reduced Course Load](#) eForm in iStart. All exceptions granted by the International Student Adviser must be reported to DHS within 21 days, as well as the return to full-time status. Note: Exceptions to full-time study due to academic difficulties are limited to one semester during the entire program of study; documented medical illnesses are limited to one year during the program of study. Failure to enroll for full-time study will be reported in the Student and Exchange Visitor Information System (SEVIS) as a violation, and the student's SEVIS record will be terminated for "unauthorized drop below full course level."

Credit Loads for International Students

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

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

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

International students with student visas must normally maintain full-time academic status during the Fall and Spring semesters, irrespective of whether or not 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 <https://global.psu.edu>.

EMPLOYMENT REQUIREMENTS/OPTIONS FOR INTERNATIONAL STUDENTS

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

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

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

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

AMERICAN ENGLISH ORAL COMMUNICATIVE PROFICIENCY TEST (AEOCPT)

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

Section III –Academic Procedures for Graduate Students

GRADUATE DEGREE PROGRAMS BULLETIN

The Graduate Degree Programs Bulletin (<https://bulletins.psu.edu/graduate/>) contains policies mandated by the Graduate School regarding academic procedures, registration requirements, conduct, resolution of problems and procedures for termination, M.S. degree and Ph.D. degree requirements, as well as other procedures, regulations and requirements as related to graduate study.

UNSATISFACTORY SCHOLARSHIP

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

DEADLINES

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

MINORS

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

GRADING SYSTEM

Grades shall be assigned to individual students on the basis of the instructor's judgment of the student's scholastic achievement, using the grading systems that can be found at http://www.registrar.psu.edu/grades/grading_system.cfm.

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

CONCURRENT DEGREES

Students who wish to pursue a concurrent degree must be officially admitted to the concurrent degree program prior to substantial completion of the home degree. Specifically, students in master's or professional doctoral degree programs must be officially admitted to pursue a concurrent degree prior to having accumulated 75% or more of the credits required for the home degree and prior to their final semester in the home degree. **Research doctorate (Ph.D.) students must be officially admitted to the concurrent degree program prior to scheduling the comprehensive examination in the Ph.D. program.** See <http://gradschool.psu.edu/graduate-education-policies/gcac/gcac-200/gcac-209-concurrent-degrees/> for the complete policy. Please contact the ME Graduate Programs Office if interested in pursuing a Concurrent Degree.

COURSE LOAD

Full-time students and students receiving fellowships typically should register for 9-12 credits per semester during the academic year. Most graduate students do not register for courses during the summer, with the exception of Ph.D. students who schedule their comprehensive exam or final defense during the summer. If in doubt, contact the Graduate Programs Office before scheduling courses, especially for the summer.

M.S. students are not required to register for course work or research once the minimum course requirements have been met, although international students may need to register for courses to maintain their visa status. 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 completion of the Qualifying exam and completion of the Ph.D. program as a registered full-time student. For details, see the Graduate Degree Programs Bulletin at <https://bulletins.psu.edu/graduate>.

DROPPING and ADDING COURSES

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

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

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

1. The **pre-semester period** begins on the first day of scheduling and ends the day before the semester starts. While exceptional circumstances may necessitate the need to process schedule changes after classes begin, students are encouraged to finalize all schedule changes prior to the first day of classes for the semester.
2. The **regular drop/add period** begins the day that your courses start, and is when dropping a course can be done without incurring a drop/add fee. The length of the period is six days from the beginning of the semester during fall/spring for full-semester courses, and is a calculated proportional length for other courses (see Registrar's Academic Calendar at https://registrar.psu.edu/academic_calendar). No signatures are required.
3. A student can drop a course with certain restrictions and requirements after the regular drop/add period. The **late-drop period** starts the day after the regular drop period, and ends on the late-drop deadline for the semester. During this period:
 - No signatures are required
 - A fee is imposed for each transaction
 - Courses are recorded on the student's record as "LD"

Changing your overall number of credits after courses begin can have financial implications.

- Before making any registration changes, consult with your academic adviser.
- If you drop below full-time status, that can impact the tuition, fees, student aid, and refunds applied to your bursar account. Additionally, during the late-drop period, the University assesses a processing fee for any course that is dropped or added. Any tuition adjustment is determined by the effective date of the drop, and is made according to Penn State's Tuition Adjustment Schedule (<https://www.bursar.psu.edu/tuition-adjustment-policy>). If a full-time graduate student drops a course but remains at full-time status, the tuition rate does not change.

- You should also investigate whether or not you would meet the “Satisfactory Academic Progress” standards for federal financial aid programs when considering a course drop. Details about satisfactory academic progress is available at the <https://studentaid.psu.edu/>.
- During the pre-semester period, you can add and drop courses as many times as needed to create a suitable schedule, without unfavorable financial implications. Please be mindful to check your tuition bill for updates if you make changes to your schedule (especially if adding credits) after you have paid your tuition bill.

AUDITING COURSES

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

TRANSFER OF CREDITS

Transfer of Credit from an External Institution

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

Application forms for transfer of credit can be found at <https://gradschool.psu.edu/current-students/>.

Transfer of Nondegree Graduate Credits

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

- The credits must have been earned within five years preceding entry into the degree program. Requests to transfer graduate work taken more than five years

prior to admission into a graduate degree program must be accompanied by a letter justifying the validity of the course work.

- Only 400, 500 and 800-level graduate courses may be transferred.
- Only A, B, and C grades will be transferred.

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

SUGGESTED CORE COURSES

Students are expected to select courses and to write a thesis or paper in one or more general subfields within Mechanical Engineering, which may include:

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 six general areas is provided for guidance. Your adviser 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 ME497x for undergraduate courses, or as ME597x for graduate courses. The on-line schedule of courses (see below) will show which courses are being offered each semester.

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

COLLOQUIUM REQUIREMENT (ME 590)

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

MATHEMATICS REQUIREMENT

The Master of Science degree program in Mechanical Engineering requires three credits of mathematics. These credits must be taken from the following group of courses: E MCH 524A, E MCH 524B, ME 512, ME 550, ME 597 (Adv. Engr Math), and all 400 and 500 level "MATH" designated courses (MATH 4XX, MATH 5XX) except MATH 419, 427, 428, 435, 451, 455, 456, 461, 470, 471, 475, 475W, 482 and 484.

Courses with a specific focus on numerical analysis will not count toward the mathematics requirement.

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

Graduate students registering for these courses must first consult with their adviser (or the instructor if different from adviser) to ensure that they are registering for the appropriate course and section. Failure to select the correct course may result in the student having to pay retroactive drop/add fees, and possibly additional course-credit fees. The ME Graduate Programs Office staff can assist graduate students in registering for the appropriate course and section.

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

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

ME 600 (610 Off Campus) - THESIS RESEARCH - **This course should be used to register for M.S. and Ph.D. thesis research.** A minimum of six credits of ME 600, supervised by the student's adviser, is required when submitting a M.S. thesis. There is no limit on the total number of credits of 600 that a student can take. However, there is a maximum number of credits for which a student can receive a quality letter grade (A, B, etc.). A student must receive a non-letter grade (R, etc.) for any additional credits of 596/600. The R grade is assigned for satisfactory completion of research. See <https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-400/gcac-401-grading-system/>.

LIMITS ON RESEARCH CREDITS (ME 600)

Students registering for 600 or 610 should be aware that Graduate Council has established limits on the total number of research credits that can be assigned letter grades in a

student's program (i.e., grades other than R). Students are not permitted to have more graded credits of research than stated by the policy: <http://gradschool.psu.edu/graduate-education-policies/gcac/gcac-400/gcac-401-grading-system/>.

The maximum allowable number of graded credits of ME 600 is as follows:

M.S. only – 6 credits

Ph.D. only – 12 credits

Ph.D. with an “M.S. along the way” (M.S. paper or Option C) – 12 credits

Ph.D. with an “M.S. along the way” (M.S. thesis) – 18 credits

ME 601 (611 Part time) - Ph.D. THESIS PREPARATION

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

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

FACULTY RESEARCH INTERESTS

A list of faculty members in Mechanical Engineering can be found at the ME website: <https://www.me.psu.edu/department/faculty-staff-list.aspx>. The ME faculty directory contains information on each ME 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 adviser. Alternatively, students can search by research area at <https://www.me.psu.edu/research/labs.aspx>.

SCHOLARSHIP AND RESEARCH INTEGRITY (CITI & SARI RCR)

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:

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

SARI RCR Overview

Every student must complete five hours of discussion-based SARI RCR (Responsible Conduct of Research) education during his/her first year. SARI RCR hours can be earned by completing a SARI module that is normally offered as part of ME 590, attending SARI ORP events (two hours maximum), and/or doing SARI modules on Canvas.

CITI online does not count toward the five hours of SARI RCR.

If you have any questions, ask us at grad@me.psu.edu or 814-865-1345.

CITI On-line Training

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

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

Section IV –Degree Programs

MASTER OF SCIENCE DEGREE PROGRAM

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

1. A 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 of the 30 credits must be in 500- and 600-level courses. See specific requirements for Options A, B and C below.
3. A minimum of 12 credits in 400- and 500-level courses in Mechanical Engineering. **ME 410, 440W, 441W, 450, 454, and any other required undergraduate courses cannot be included in these 12 credits.** If in doubt, please contact the Graduate Programs Office before enrolling in a ME 400-level course. NOTE: ME 596 cannot be used to fulfill this requirement. ME 596 cannot be used as a substitute for ME 600. 596 courses in other departments cannot be used to fulfill ME course requirements.
4. The M.S. degree program in Mechanical Engineering requires three credits of mathematics. These credits must be taken from the following group of courses: E MCH 524A, E MCH 524B, ME 512, ME 550, ME 597 (Adv. Engr Math), and all 400- and 500-level "MATH" designated courses (MATH 4XX, MATH 5XX) except MATH 419, 427, 428, 435, 451, 455, 456, 461, 470, 471, 475, 475W, 482 and 484. **Courses with a specific focus on numerical analysis do not meet the mathematics requirement.**
5. All M.S. students will present the results of their thesis or paper at a meeting consisting (at a minimum) of their adviser and the thesis or paper reviewer (who is a member of the ME Graduate Faculty). This requirement may be waived if the student makes a

presentation related to his/her thesis or paper at a national or international scientific conference.

6. Preparatory course(s) required for teaching assistants (such as ENGR 888), remedial courses, and any courses required in our ME undergraduate program cannot be counted toward meeting the degree requirements.
7. All students must successfully complete two credits of ME 590 Colloquium in their first two semesters in the program. These two colloquium credits do not count toward the 30 graduate course credits in Requirement 1 above.
8. All students must complete SARI/CITI (Scholarship and Research Integrity) training.

There are three options for the M.S. degree, which are outlined in the following.

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 requires at least 24 course credits, of which 12 credits must be at the 500 level, and in addition completion of six thesis research credits. At least twelve credits must be 400- or 500-level Mechanical Engineering courses. ME 596 does not count towards meeting the requirements for the thesis option.

OPTION B - M.S. PAPER

Candidate registers for a minimum of 30 course credits, of which 18 credits must be at the 500 level. Candidate must complete **three credits of ME 596**, which can be counted in the total of 30 credits. At least 12 credits must be 400- or 500-level Mechanical Engineering courses. Candidate writes a paper on a topic mutually agreed upon by the adviser, and that is suitable for publication in a professional journal or presentation at a national or international conference. See the [M.S. Paper Guide](#) below for expectations. ME 600 does not count towards meeting the requirements for the paper option.

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 M.S. paper per Option B above. Other requirements are:

1. Successful completion of the Ph.D. Qualifying examination;
2. Completion of required courses following Option B – M.S. Paper per above;
3. Acceptance of the research proposal by their doctoral committee; and
4. Designating the intent to exercise this option to the ME Graduate Programs Office **prior to completion of the Ph.D. Comprehensive Exam.**

M.S. Paper Guide

To ensure that M.S. papers meet accepted professional quality standards, the following guidelines have been established by the ME Graduate Faculty. Compliance will be monitored and enforced by the paper adviser, the paper reader and the Associate Department Head for 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 adviser, 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 adviser, 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: <https://www.asme.org/publications-submissions/proceedings/conference-publications>. In this case, the paper reader must judge whether the paper would be acceptable, in principle, for publication in the target journal or presentation at the target conference. This option will place a greater burden on the reader, as he/she will not have the advantage of knowing that external peer reviewers are also reading and evaluating the paper.

THESIS GUIDE

The Graduate School Office of Thesis and Publications provides a [Thesis Guide](#), which provides formatting instructions, can be located at on the Penn State Graduate School site at <https://gradschool.psu.edu/completing-your-degree/thesis-and-dissertation-information/>. The Penn State Thesis Template can be found at this same site.

M.S. THESIS/PAPER APPROVAL PROCEDURE

Selection of a Faculty Reviewer (Reader)

Master's thesis and paper reviewers are chosen by the student in conjunction with their adviser. The reader must be a member of the Mechanical Engineering Graduate Faculty, and should be appointed in a timely manner to ensure they have adequate time to review the work. If the student and adviser are not able to identify a suitable reader, one can be assigned by the Associate Department Head for Graduate Programs.

Oral Presentation of Thesis or Paper

All M.S. students must present the results of their thesis or paper at a meeting consisting (at a minimum) of their adviser and the thesis or paper reviewer. This requirement may be waived if the student makes a presentation related to his/her thesis or paper at a national or international scientific conference.

To the Graduate Student: A typed draft of the thesis/paper must receive three approval signatures in the order indicated on the M.S. Thesis/Paper Approval Form: the thesis/paper advisor, the thesis/paper reader, and the Associate Department Head for Graduate Programs. The completed approval form must be given to the Graduate Programs Office staff to be recorded and filed.

To the Thesis/Paper Adviser: If there are questions or problems concerning the reviewer's comments, the thesis/paper adviser should arrange for a discussion with the reviewer. When the adviser and the reviewer have reached agreement, the adviser 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 adviser concerning any changes you believe are essential. Minor corrections or editorial changes can be noted without discussion. If you wish to discuss the material with the candidate, it is recommended that you do so in the presence of the thesis adviser.

Thesis, Dissertation, Performance and Oral Presentation Deadlines

Important Deadlines for each semester can be found on the Graduate School's website: <https://gradschool.psu.edu/completing-your-degree/thesis-and-dissertation-information/thesis-dissertation-performance-and-oral-presentation-deadlines-calendar/>. In addition, the ME Graduate Programs Office will send specific instructions regarding graduation at the beginning of each semester. Students writing M.S. papers must contact the ME Graduate Programs Office for deadlines.

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 such a request to be processed.

DOCTOR OF PHILOSOPHY DEGREE PROGRAM

PH.D. COURSE REQUIREMENTS

There are no formal course requirements for the Ph.D. degree, beyond the Colloquium Requirements described above. Course requirements are established solely by the doctoral committee.

RESIDENCY REQUIREMENT

There is no required minimum number of credits or semesters of study, but over some twelve-month period during the interval between admission to the Ph.D. program (completion of the Qualifying Exam) and completion of the Ph.D. program, the candidate must spend at least two semesters (summer sessions are not included) as a registered full-time student engaged in academic work at the University Park campus. Note that 601 cannot be used to meet the full-time residency requirement. See <https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-700/gcac-700-a-residency-requirement-professional-doctorates/>.

CONTINUOUS REGISTRATION

It is expected that all graduate students will be properly registered at a credit level appropriate to their degree of activity. After a Ph.D. candidate has passed the Qualifying Examination, the student must register continuously for each fall and spring semester until the final oral examination is passed. See <https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-600/gcac-601-residency-requirement-research-doctorate/>.

PH.D. QUALIFYING EXAMINATION

According to the Graduate University Bulletin: "A student who has been admitted to the Graduate School and has been accepted by the department or committee in charge of a major program in which the doctorate is offered may begin working toward a doctoral degree. However, the student has no official status as a doctoral student and no assurance of acceptance as a doctoral candidate until the Qualifying Examination has been passed." See <https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-600/gcac-604-qualifying-exam/>. Formal admission to the doctoral program is based on passing the doctoral Qualifying Examination, which is administered by the Department faculty.

Immediately after passing the Qualifying Examination, a doctoral committee must be formed. Graduate School policy is that the committee must be formed no later than one year after successful completion of the Qualifying Examination. The members of the committee will be selected by the academic adviser in consultation with the student. The adviser will recommend the members to the Associate Department Head for Graduate Programs, who in turn will notify the Graduate School. The ME Graduate

Programs Office staff assistant will provide the Ph.D. committee form to the student after the committee is approved by the Associate Department Head. Students who fail to locate an adviser for the doctoral program after passing the exam will be advised that such action constitutes "unsatisfactory scholarship," which can be grounds for dismissal from the University.

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

- a) The academic record of the student;
- b) A Qualifying Examination given by the major department; and
- c) Evidence of research capability based on adviser recommendations.

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

Purpose

The purpose of the Qualifying 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 Qualifying Examination can be found at <https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-600/gcac-604-qualifying-exam/>.

Key points are as follows:

- The Department strongly encourages students to take the Qualifying Examination at the earliest possible time.
- 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 Qualifying Examination will be administered each Fall and each Spring semester, and is usually scheduled during the second week of classes. The exam takes place over the course of one week; written exams are usually on Tuesday-Friday and oral exams are on Saturday. Dates for the Qualifying Examination will be announced by the Graduate Programs Office by email to all graduate students.

Format

The Qualifying 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.

Written and oral English proficiency will also be assessed. See the next section for 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 their respective areas. Samples of written exam problems from previous years will be provided to students. 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 being a recommended fail and above 7 a recommended pass.

Oral exams

Topic areas for oral exams will correspond to those in the written exams. Two faculty evaluators will conduct each oral exam. The student's adviser 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 being a recommended fail and above 7 a 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. This will be done at a special faculty meeting devoted solely to reviewing results from the written and oral exams, and the student's academic record.

At that meeting, the faculty will vote to either pass or fail each student in each of the three sections. Each student must pass three different sections to be admitted into the Ph.D. program.

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

The seven currently available topic areas are described below: Solid Mechanics, Rigid Body Mechanics, System Dynamics, Fundamentals of Engineering Analysis, Thermodynamics, Fluid Mechanics and Heat Transfer. 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 those given below and who volunteer to serve as examiners for the new area. The formal description must contain a list of topics to be covered and citations for at least two textbooks from which students may study the specified topics. A new provisional topic area must be approved by majority vote of the Mechanical Engineering Graduate Faculty before it is offered and added to the list of standard topic areas.

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

SOLID MECHANICS

Topics may include:

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

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

Courses that cover relevant material: EMCH 211, 213, 315, ME 360 Mechanical Design; material also reviewed in ME 560 Solid Mechanics.

RIGID BODY MECHANICS

Topics may include:

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

Texts: *Engineering Mechanics: Dynamics*, Gray, Costanzo and Plesha, McGraw-Hill. *Design of Machinery*, Norton <https://www.amazon.com/Machinery-Resource-McGraw-Hill-Mechanical-Engineering/dp/007742171X>

Courses that cover relevant material: ME 480 Mechanism Design and Analysis, ME 370 Vibrations of Mechanical Systems or equivalent, EMCH 212 Dynamics.

SYSTEM DYNAMICS

Topics may include:

- Theory and application of mechanical vibrations.

- Modeling of dynamic systems including mechanical, electrical, fluid, thermal and mixed systems.
- Theory and application of feedback control systems.

Texts: *Mechanical Vibrations*, Rao, Prentice Hall. *Vibration of Mechanical Systems*, Sinha, Cambridge University Press. *Dynamic Modeling and Control of Engineering Systems*, Kulakowski, Gardner, and Shearer, Cambridge University Press.

Courses that cover relevant material: ME 370 Vibrations of Mechanical Systems; ME 450 Modeling of Dynamic Systems.

FUNDAMENTALS OF ENGINEERING ANALYSIS

The written examination will consist of three questions, where one question will be set from each of the following three areas:

1. *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 (if available): Introduction to Analysis (<https://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)]
2. *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 (if available): (<http://ocw.mit.edu/courses/mathematics/18-03sc-differential-equations-fall-2011>) and (<http://ocw.mit.edu/courses/mathematics/18-152-introduction-to-partial-differential-equations-fall-2011/>)] [Typical Textbooks: (1) Partial Differential Equations for Scientists and Engineers by S.J. Farlow 1982 – Relevant Chapters and (2) Advanced Engineering Mathematics, 11th ed. by E. Kreyszig 2011 – Relevant chapters]
3. *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 (if available): <https://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, could 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.

Courses that cover relevant material: 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.

Texts: *Fluid Mechanics*, Cengel and Cimbala, McGraw-Hill. *Fluid Mechanics*, White, McGraw-Hill. *Fundamentals of Fluid Mechanics*, Munson, Young, and Okiishi, Wiley. *Introduction to Fluid Mechanics*, Fox & McDonald, Wiley. *Viscous Fluid Flow*, White, McGraw-Hill. Or similar texts.

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

HEAT TRANSFER

Topics may include:

- Conduction--transient and steady state;

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

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

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

MECHANICAL ENGINEERING QUALIFYING EXAM - 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 Qualifying 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 Qualifying 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 adviser may observe the presentation, but may not ask or answer questions.

The topic for the presentation is 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 Qualifying 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 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.

MECHANICAL ENGINEERING DOCTORAL COMMITTEE

Mechanical Engineering Doctoral Committee Policy

When a graduate student has passed the Qualifying Examination, a Ph.D. committee should be formed IMMEDIATELY to ensure that the student will receive proper guidance early in his/her program. Graduate School policy is that the committee is to be formed no later than one year after passing the Qualifying Examination. It is expected that your Ph.D. committee is established well in advance of scheduling your Comprehensive Examination.

Ph.D. committee membership composition and responsibilities are specified in Graduate School policies GCAC-602 and GCAC-603, which are available at <https://gradschool.psu.edu/graduate-education-policies/>. The candidate and the candidate's adviser 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, to 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 ME. Additionally, 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 of the committee must be members of the Mechanical Engineering Graduate Faculty. Names of the proposed committee should be forwarded the Associate Department Head for Graduate Programs for approval through the ME Graduate Programs Office. The Associate Department Head for Graduate Programs may approve the suggested committee members or may discuss possible changes, and will request the Graduate School to form the committee. The Graduate School will appoint the committee and notify all persons concerned. At this point, the student's program is under the complete control of their Ph.D. committee. The ME 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 adviser (which is usually the case), he/she has the following additional responsibilities:

- a) Direct the research program;
- b) Assist the student in selecting courses;
- c) Supervise and release the research proposal and the 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) Review student's 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. Graduate School policy (<https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-600/gcac-603-phd-committee-responsibilities/>) requires that a written report on each Ph.D. candidate's progress be submitted annually to the program's Graduate Programs office. If there is a substantial change in the student's program of study or research objective, the committee should meet. A written record of this meeting describing these changes must be sent to the Department for inclusion in the student's official records. Once a committee is established, any requests to alter the committee membership must be made in writing to the Graduate Programs Office. All members currently on the committee and any member(s) to be added must be cc'd on the request.

PH.D. 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.

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

PH.D. THESIS REVIEW PROCEDURE

The Ph.D. dissertation will be reviewed by each member of the student's doctoral committee. Prior to submission to each committee member, the thesis draft should have been read by the thesis adviser 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 Department Head for Graduate Programs. The Graduate Program Office will then request the exam to be scheduled through the Graduate School. 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

Important deadlines for each semester are published by the Graduate School: <https://gradschool.psu.edu/completing-your-degree/thesis-and-dissertation-information/thesis-dissertation-performance-and-oral-presentation-deadlines-calendar/>. Students are responsible for meeting the published deadlines.

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

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

GRADUATE STUDENT CHECK-OUT SHEET

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

EXIT INTERVIEWS

Every graduate student must schedule an exit interview with the Associate Department Head for Graduate Programs. Schedule your interview well in advance of your leaving the University, and complete the required paperwork (available from the Graduate Programs Office) prior to your interview.