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MECHANICAL ENGINEERING HANDBOOK: DOCTOR OF PHILOSOPHY

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This handbook provides information about department policies and procedures, as well as specific details pertinent to the following Doctoral degree programs:

- *Doctor of Philosophy – Advanced Entry*
- *Doctor of Philosophy – Direct Entry*
- *Joint Ph.D. with Engineering and Public Policy*
- *Ph.D. Partnership with A*STAR*
- *Ph.D. Partnership with the Max Planck Institute*

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MECHANICAL ENGINEERING PHD HANDBOOK

1. Welcome to Mechanical Engineering

We thank you for choosing the Mechanical Engineering Department and hope your time here will be both successful and enjoyable.

The Mechanical Engineering Department at Carnegie Mellon University offers an intellectually stimulating, collaborative environment to advance your learning as a graduate student. Today's mechanical engineers work across technologies and disciplines to solve some of society's toughest problems. The department answers the need for professional skills with a comprehensive program that provides depth in mechanical engineering fundamentals and breadth in emerging multidisciplinary topics. Academic activities are balanced with hands-on research opportunities that give our graduates the ability to frame complex problems and collaborate widely across organizations.

Our diverse student body currently includes over 350 full-time graduate students, post-doctoral researchers, and part-time students. At the graduate level, the department offers a Master of Science in Mechanical Engineering degree, a Master of Science in Mechanical Engineering—Advanced Study degree, and a Master of Science in Mechanical Engineering—Research degree, as well as Direct and Advanced Entry Ph.D. degrees.

This handbook describes the Department policies that govern the Ph.D. programs in Mechanical Engineering ("MechE"). It is not an exhaustive list of all applicable policies. College of Engineering (CIT) and University policies supercede Department policies. The handbook provides links, where appropriate, to relevant College or University policies, including [The Word](#) (the student handbook). Information from the Office of the Assistant Vice Provost for Graduate Education, and from the Office of the Dean of Student Affairs and others are included in [Appendix B](#). Students should consult these external resources to familiarize themselves with all policies that apply to Carnegie Mellon University Ph.D. students.

Students may contact one of the department administrators (see personnel below) to request this handbook in a different format to address accessibility needs.

1.1 DEPARTMENT PERSONNEL

- Department Head – Prof. Allen Robinson
<https://www.meche.engineering.cmu.edu/faculty/robinson.html>
Assistant – Katherine Sencindiver – 412-268-3860 (SH 426), sencindiver@cmu.edu
- Head of Graduate Education Committee (GEC) – Prof. Alan McGaughey
<https://www.meche.engineering.cmu.edu/faculty/mcgaughey.html>

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- Mechanical Engineering Graduate Administrators
 - Chris Hertz, Manager of Academic Programs, 412-268-3175 (SH 405), chertz@andrew.cmu.edu
 - Melissa Brown, Manager of MS Programs, 412-268-1562 (SH 407), mlb2@andrew.cmu.edu
- The Graduate Administrators assist with academic or personal situations that graduate students may not have the resources to resolve. If you have questions or concerns, please schedule an appointment: <https://www.meetme.so/MechEAdvisors>. Additionally, students may confer with the university graduate student ombudsperson, Suzie Laurich-McIntyre, slaurichmcintyre@cmu.edu, on issues of process or other concerns as they navigate conflicts. Suzie Laurich-McIntyre is the Assistant Vice Provost for Graduate Education.
- Faculty: <https://www.meche.engineering.cmu.edu/faculty/directory-faculty.html>
- Department Points of Contact (Staff):
<https://www.meche.engineering.cmu.edu/faculty/directory-staff.html>
- Department location: Scaife Hall 402
- Department phone: 412-268-2500
- Department fax: 412-268-3348

1.2 COLLEGE PERSONNEL

- Dean, College of Engineering (CIT) – Jonathan Cagan
<https://engineering.cmu.edu/about-us/leadership/dean-bio.html>
- Assistant – Sue Haslett – 412-268-6196 (SH 110)
- Associate Dean for Graduate and Faculty Affairs – Shelley Anna
412-268-3713 (SH 110)

1.3 ACADEMIC CALENDAR

The Academic Calendar can be found at <https://www.cmu.edu/hub/calendar/index.html> and provides information on all deadlines including registration dates, class start dates, add/drop deadlines, exam dates and more.

2. University Policies, CMU Statement of Assurance, & CMU Code

It is the responsibility of each member of the Carnegie Mellon community to be familiar with university policies and guidelines. In addition to this departmental graduate student handbook, the following resources are available to assist you in understanding community expectations:

- The Word/Student Handbook: www.cmu.edu/student-affairs/theword//index.html
- Academic Integrity Website: <https://www.cmu.edu/policies/student-and-student-life/academic-integrity.html>
- University Policies Website: www.cmu.edu/policies/
- Graduate Education Website: <http://www.cmu.edu/graduate/policies/index.html>
- Carnegie Institute of Technology (CIT) Website: <http://engineering.cmu.edu/>

Please see [*Appendix B*](#) for additional information about The Word and University resources.

2.1 CARNEGIE MELLON UNIVERSITY STATEMENT OF ASSURANCE

Carnegie Mellon University does not discriminate in admission, employment, or administration of its programs or activities on the basis of race, color, national origin, sex, handicap or disability, age, sexual orientation, gender identity, religion, creed, ancestry, belief, veteran status, or genetic information. Furthermore, Carnegie Mellon University does not discriminate and is required not to discriminate in violation of federal, state, or local laws or executive orders.

Inquiries concerning the application of and compliance with this statement should be directed to the Vice President for Campus Affairs, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA 15213, telephone 412-268-2056.

Obtain general information about Carnegie Mellon University by calling 412-268-2000.

The Statement of Assurance can also be found on-line at:

<http://www.cmu.edu/policies/administrative-and-governance/statement-of-assurance.html>.

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2.2 THE CARNEGIE MELLON CODE

Students at Carnegie Mellon, because they are members of an academic community dedicated to the achievement of excellence, are expected to meet the highest standards of personal, ethical and moral conduct possible.

These standards require personal integrity, a commitment to honesty without compromise, as well as truth without equivocation and a willingness to place the good of the community above the good of the self. Obligations once undertaken must be met, commitments kept.

As members of the Carnegie Mellon community, individuals are expected to uphold the standards of the community in addition to holding others accountable for said standards. It is rare that the life of a student in an academic community can be so private that it will not affect the community as a whole or that the above standards do not apply.

The discovery, advancement and communication of knowledge are not possible without a commitment to these standards. Creativity cannot exist without acknowledgment of the creativity of others. New knowledge cannot be developed without credit for prior knowledge. Without the ability to trust that these principles will be observed, an academic community cannot exist.

The commitment of its faculty, staff and students to these standards contributes to the high respect in which the Carnegie Mellon degree is held. Students must not destroy that respect by their failure to meet these standards. Students who cannot meet them should voluntarily withdraw from the university.

The Carnegie Mellon Code can also be found on-line at:

<https://www.cmu.edu/student-affairs/theword/>

3. Mechanical Engineering Department Structure

The Department of Mechanical Engineering ("MechE") is part of Carnegie Mellon University's College of Engineering, the Carnegie Institute of Technology ("CIT"). The MechE Graduate Education Committee ("GEC") administers the MechE graduate programs.

3.1 GRADUATE EDUCATION COMMITTEE

The GEC and its subcommittees (Ph.D. and M.S.) establish graduate curricula and requirements, policies, and course changes and additions. The GEC coordinates graduate student advising, admission and financial aid decisions, the Ph.D. qualifying exams, and provides major support for the graduate recruitment process.

Graduate student concerns, suggestions, and feedback should be directed to the Graduate Committee Chair through the Graduate Administrator (see [Department Personnel](#)) or through the Mechanical Engineering Graduate Student Organization (MEGSO).

4. The Ph.D. Degree

Specific requirements for attainment of the Ph.D. degree are found in this section of the handbook. The Ph.D. has two primary components: course-work and research. Additional requirements are seminar, a yearly review, the qualifying exam, teaching assistantships, thesis proposal, oral defense, and submission of a written thesis.

Ph.D. students should meet with their faculty advisor and program administrator periodically throughout their matriculation to ensure that they are meeting all degree requirements. It is ultimately the student's responsibility to satisfy all requirements for graduation. Students should utilize the [requirement tracking sheet\(s\)](#) provided by the graduate program administrator to track progress.

The Ph.D. degree prepares students for research careers in academia or industry. Students typically complete the Ph.D. degree requirements in four to five years, but the duration will vary depending on research progress and the specific field of study.

Early in the program, students focus on course-work that enhances their fundamental knowledge of mechanical engineering and their chosen research domain. Department of Mechanical Engineering courses have the numerical designation of 24-####. To learn more about graduate-level course offerings, visit the [Schedule of Classes](#) and the list of MechE [courses](#).

Within one year of enrollment, students must take the qualifying exam, which is an oral exam that tests research skills and fundamentals in a core mechanical engineering subject area. Students also gain educational experience through teaching assistantships. Student research forms the core of the Ph.D. program. Research involves active student-directed inquiry into an engineering problem that leads to the discovery and dissemination of new knowledge. The research culminates in a written thesis and an oral defense.

4.1 OBJECTIVES OF THE PH.D. DEGREE

- To gain expertise in a chosen engineering-science domain
- To conduct world-class research in a specific engineering-science domain
- To discover and disseminate new knowledge in a specific engineering-science domain
- To learn outside of the classroom
- To conduct independent research
- To present complex ideas to a technical audience
- To develop engineering-science knowledge

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Students achieve these objectives through a combination of course work, examinations, teaching, and research.

4.2 ENTRY DISTINCTIONS

Course requirements vary based on a student's prior educational background (whether students enter the program with a B.S. or M.S. in Mechanical Engineering or closely related field). Slight variants of the rules exist for dual Ph.D. programs administered in conjunction with other departments at Carnegie Mellon or other institutions. These rules and variations are outlined below.

4.2.1 ADVANCED ENTRY PH.D.

The Advanced Entry Ph.D. is for students who have previously attained an M.S. in Mechanical Engineering or a closely related field. Advanced entry students have reduced course requirements compared to Direct Ph.D. students. Students entering with a degree other than Mechanical Engineering may need to take additional course work, and should consult with the GEC and graduate program administrator prior to registration.

4.2.2 DIRECT ENTRY PH.D.

The Direct Entry Ph.D. is for students entering the program with a B.S. in Mechanical Engineering or a closely related field. These students have more course requirements compared to Advanced Entry Ph.D. students. Students entering with a degree other than Mechanical Engineering may need to take additional course work, and should consult with the GEC and graduate program administrator prior to registration.

Integrated Master's/Ph.D. Requirements

An integrated program is available to MechE Ph.D. students who also wish to complete a master's degree in mechanical engineering. Ph.D. students may complete an M.S. degree on the way to Ph.D. by completing the Master of Science in Mechanical Engineering (MSME) requirements. Interested students must alert the Graduate Program Administrator prior to their thesis defense. Once all M.S. requirements are completed, students may be certified with an M.S. degree. Courses and research used to complete M.S. requirements will be double-counted towards the Ph.D. degree.

See the [M.S. Handbook](#) for MSME requirements.

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4.3 PH.D. DEGREE REQUIREMENTS

4.3.1 The Ph.D. requirements are summarized in the table below:

Coursework	<p>For Advanced Entry Ph.D.:</p> <ul style="list-style-type: none"> - Minimum 60 units (minimum 36 units must be MechE (24-6## or 24-7##) including the math requirement listed below). <p>For Direct Entry Ph.D.:</p> <ul style="list-style-type: none"> - Minimum 96 units (minimum 48 units must be MechE (24-6## or 24-7##) including the math requirement listed below). <p>For all Ph.D.:</p> <ul style="list-style-type: none"> - One math course from the approved list (see Appendix D) - Technical electives (additional MechE courses (24-###) or courses from an approved department) are used to complete the remaining course units - All courses must be graduate-level courses (600 or 700 level) - May include Supervised Reading (24-793 up to 3 units) taken as a supplement for a 9-unit course. A letter grade will be given and factor in the QPA. May be used one-time only. - May not include Supervised Reading (24-793) taken as pass/fail independent study, Thesis Research (24-797), or Ph.D. Internship in Teaching Counterpoint (24-795) - Cumulative grade point average must be 3.0 or higher at graduation (See QPA Calculation section of handbook)
Research Units	<ul style="list-style-type: none"> - Must register for Thesis Research every semester (24-797) – variable units
Additional Requirements	<ul style="list-style-type: none"> - Two oral qualifying exams (Research and Subject) taken within one year of entry - Two Teaching Assistantship (TA) assignments (12 units of 24-795 section A for each assignment) - Thesis Proposal (Must pass qualifying exams first. Typically takes place 2-3 years after entry.) - Formal public thesis defense - Comprehensive and professionally written thesis (approved by the advisor/thesis committee and submitted to the department prior to graduation)
Yearly Review	<ul style="list-style-type: none"> - A “PhD Annual Report” signed by the student’s advisor(s) is required each year
Departmental Seminar	<ul style="list-style-type: none"> - Required every semester for full-time students
Responsible Conduct of Research (RCR) Training	<ul style="list-style-type: none"> - Mandatory for all CIT students conducting research (see policy)
Max units per semester	<p>Students are limited to a maximum of 54 total units per semester. No exceptions.</p>

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4.3.2 Coursework

Courses are a primary focus of the early part of the Ph.D. program, and form a foundation for research. There are two objectives of Ph.D. coursework: (1) to gain broad knowledge of mechanical engineering fundamentals and (2) to gain in-depth understanding of an area of engineering closely related to the student's research. The course requirements should be viewed as a minimum; students are encouraged to take additional courses to expand the breadth and depth of their knowledge.

Students must discuss the selection of courses with their faculty advisor. Courses must fit into the student's overall educational plan for their MechE degree. Students do not receive credit for independent study, supervised reading, or research course numbers taken outside of MechE.

4.3.3 Policy on Double Counting Courses

No courses used to fulfill requirements of a previously completed degree shall count towards any MechE degree requirement. Likewise, no courses used for any MechE degree shall double count towards another degree. No courses may double count for Ph.D. except in the following cases:

- Students who have previously received their M.S. degree in the MechE department at CMU.
 - In such cases, the course used to fulfill the math requirement for the M.S. degree may also satisfy the math requirement for Ph.D.
- Integrated M.S./Ph.D: All courses taken as a Ph.D. student may double-count towards an MSME degree.
- Joint Ph.D. with EPP: A course that satisfies both a MechE requirement *and* an EPP requirement may be double-counted.

4.3.4 Policy for Courses Taken Outside of the Department/College

The technical electives component of the Ph.D. requirements creates flexibility for students to tailor their coursework towards their technical interests. Ph.D. students may take courses and receive credit from the following departments (graduate level courses only – ##-6## or ##-7##): all departments in the College of Engineering (Biomedical Engineering [42-###], Chemical Engineering [06-###], CIT Interdisciplinary Courses [39-###], Civil and Environmental Engineering [12-###], Electrical and Computer Engineering [18-###], Engineering and Public Policy [19-###], Integrated Innovation (49-###), Materials Science and Engineering [27-###]); all departments in the School of Computer Science (Computer Science (15-###), Human Computer Interaction (05-###), Information Systems: School of IS and Management (95-###), Institute for Software Research (08-###), Language Technologies Institute (11-###), Machine Learning (10-###), Robotics (16-###)); all departments in the Mellon College of Science (Biology (03-###), Chemistry (09-###), Mathematical Sciences (21-###), and Physics (33-###)); and Statistics (36-###).

Students may petition the GEC to count undergrad courses or courses from outside of the pre-approved departments. See [*Petition/Waiver Procedures*](#).

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4.3.5 Research

The student's research experience forms the core of the MechE Ph.D. programs. Research involves active, student-directed inquiry into an engineering problem that leads to the creation and dissemination of new knowledge. Students learn how to conduct research under the close supervision of faculty advisor(s). The research experience is overseen by a Ph.D. committee.

There are multiple goals for conducting research: (1) to become an expert and to develop new knowledge in a specific area of engineering, (2) to learn the general skills needed to conduct independent research, and (3) to discover and disseminate new knowledge.

Conducting research requires combining knowledge gained in the classroom with the ability to read the scientific literature, identify critical knowledge gaps, structure complex problems, formulate and test hypotheses, analyze and interpret data, and present and discuss technical results. Engineering research also requires significant experimental, computational, and analytical skills. A student learns these core skills as he/she pursues a research problem. Many of these skills are not learned in the classroom, but in the lab, library, and conference room as the student interacts with faculty, other students, and researchers.

Independent, non-classroom-based learning and problem solving is a core aspect of the Ph.D. degree. Upon completion of the dissertation, a Ph.D. student should be an international expert in a technical area. Dissemination of findings is an essential part of the degree program. This typically includes multiple publications in peer-reviewed, archival journals or peer-reviewed, archival conference proceedings as well as multiple presentations (oral or poster) of research at national or international technical conferences.

4.3.6 Research-Related Resources for Ph.D. Students

To learn about faculty research areas visit:

<http://www.cmu.edu/me/research/index.html>, and <https://www.cmu.edu/me/people/faculty.html>.

- Resources and Regulations Governing Research at Carnegie Mellon:
 - Environmental Health and Safety (EHS): <http://www.cmu.edu/ehs/>
 - Office of Sponsored Research: <http://www.cmu.edu/osp/>
 - Office of Research Integrity & Compliance: <http://www.cmu.edu/research-compliance/index.html>
- Intellectual Property Policy: <http://www.cmu.edu/policies/documents/IntellProp.html>
- Policy on Restricted Research: <http://www.cmu.edu/policies/research/restricted-research.html>
- Human Subjects in Research Policy:
<https://www.cmu.edu/research-compliance/human-subjects-research/>

4.3.7 Supervised Reading/Independent Study

Students enrolled in Supervised Reading and/or research must enroll in the appropriate MechE course number (24-793 for Supervised Reading and 24-797 for research). This applies even if the student is working with a faculty member outside of MechE.

Supervised Reading (24-793), also known as Independent Study, is a course designed to provide students with an opportunity for intensive study of a subject that is either unavailable or insufficiently covered in regular course work. Supervised Reading is not intended to substitute for existing courses or research, but to provide the opportunity for a specialized educational experience. A pass/fail grade will be assigned upon completion. Students must identify a faculty member willing to oversee the supervised reading and then enroll in the MechE Supervised Reading “course” number (24-793). Supervised reading/independent study “course” numbers offered by other departments do not count towards MechE degree requirements.

To receive credit for research, students must enroll in the MechE research “course” number (24-797 Thesis Research). Students shall not receive credit for research conducted under other department research “course” numbers.

Students arranging Supervised Reading must:

- Obtain approval from their faculty advisor.
- Draft a contract with the faculty instructor that describes in detail the course and its requirements. A copy of the contract must be given to the graduate administrator.

Supervised Reading may also be used to supplement an existing lower-unit course. For example, a 9 unit course can be supplemented with 3 units of Supervised Reading to create twelve units of study. In this case, the supervisor must be the teaching faculty of the lower-unit course, and the Supervised Reading units must be taken concurrently with the course being supplemented. A letter grade (A, B, C, etc.) will be assigned upon completion.

Supervised Reading may not take the place of course units or research units (24-797).

4.3.8 Qualifying Exams

Students must demonstrate their preparation to conduct research through two oral qualifying exams –a research exam and a subject exam. The exams require students to clearly present technical concepts, structure an engineering problem, respond to questions, and demonstrate engineering intuition.

- Research Exam:
 - Oral exam before a faculty committee
 - Tests knowledge of research methods and understanding of research concepts required for conducting Ph.D. research

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- Report and oral presentation are based on research performed in the first year
- Subject Exam:
 - Oral exam before a faculty committee
 - Tests graduate-level understanding of undergraduate mechanical engineering fundamentals
 - Exams are offered in seven topic areas:
 - Controls, Design, Fluids, Heat Transfer, Solids, Thermodynamics, and Vibrations
- Quals are offered in September (Fall semester) and January (Spring semester)
- Quals must be taken within 1 year of entering the Ph.D. program
- The research exam is offered first (typically during the second week of classes). The subject exam follows two or three weeks later.
- Examination Committee:
 - The research exam committee is responsible for reading the report and administering the research exam. The subject exam committee is responsible for setting the subject exam question(s) and administering the subject exam.
 - Students are asked to suggest faculty committee members for their research exam. The selection of the committee by the department is based on those suggestions plus the availability and scheduling constraints of the faculty. It is possible that students may not have one of their suggested members due to scheduling constraints.
 - On rare occasions, a qual exam committee member may be replaced due to a scheduling conflict or a conflict of interest. In these circumstances, the Department will replace the committee member and notify the student. There is no mechanism for a student or advisor to request that a committee member be changed.
- Students will be notified of the result (pass/non-pass) of their qualifying examinations via official letter from the Mechanical Engineering department as well as from their advisor(s).
- Students who do not pass either the research or the subject exam must retake the unsuccessful exam at the next offering (typically at the beginning of the next semester). Students who pass one exam but not the other, need only retake the unsuccessful exam.
- Students who do not pass a second time will not be permitted to continue in the Ph.D. program. An M.S. degree (MSME) may be obtained if all requirements have been met.

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An in-depth overview of the qualifying exams may be found in Appendix D. Practice subject tests are available from the Graduate Program Administrator. Mock qualifying exams, hosted by the Mechanical Engineering Graduate Student Organization (MEGSO), will be available approximately one or two weeks prior to the official exams.

4.3.9 Mechanical Engineering Teaching Intern (TA Assignments)

Participation in the teaching mission of the department is a requirement of the Ph.D. program. It provides a valuable learning and mentoring experience for the student. All Ph.D. students must serve as a teaching assistant (TA) for a MechE course twice during their tenure in the Ph.D program.

To fulfill the teaching requirements students must register for and pass 24-795 *Ph.D. Internship in Teaching Counterpoint* in each semester that they serve as a TA. (*Course description:* A teaching assignment under the guidance of a faculty member for intermediate or terminal-level doctoral candidates. Typical activities include preparing and teaching recitations, preparing and teaching laboratory sessions, holding office hours, grading and preparation of quizzes, problem sets and other assignments, and assisting instructor with other activities associated with teaching a course. 24-795 is 12 units and offered in Fall and Spring (P/F). All non-native English speakers must conform to the university regulation on the TA language requirements.) TA support is provided by the Eberly Center for Teaching Excellence.

Students typically serve as TA one semester in their second and third years of the Ph.D. Circumstances may arise that warrant earlier or later TA assignments. The graduate administrator will contact students who are being considered for a TA assignment. Students may be assigned as a TA for any MechE course, but each student's background and interests are considered in making assignments. The GEC will consider requests regarding a particular semester or MechE course a student requests to TA. However, the ability to grant these requests depends upon department teaching needs.

Other TA requirements:

- Details regarding mandatory TA trainings will be provided with a student's first TA assignment.
- Completion of a TA experience survey is also required after each assignment.
- Failure to complete the TA trainings or the TA experience survey will result in an incomplete grade ("I"). A passing grade ("S" for satisfactory) will be given once the trainings and survey are complete.

4.3.10 TA and Non-Native English Speakers (the ITA Test)

Graduate students are required to have a certain level of fluency in English before they can instruct in Pennsylvania, as required by the English Fluency in Higher Education Act of 1990. Through this Act, all institutions of higher education in the state are required to evaluate and certify the English fluency of all instructional personnel, including teaching assistants and interns. The full university policy can be reviewed at <https://www.cmu.edu/policies/faculty/evaluation-certification-english-fluency-instructors.html>. The fluency of all instructional personnel will be rated by the ICC (Intercultural Communication Center) to determine at what level of responsibility the student can TA. Therefore, all

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students who are non-native English speakers must take and pass a language proficiency test—the International Teaching Assistant (ITA) test administered through the ICC (<http://www.cmu.edu/icc/testing/ITA/index.shtml>).

Students must achieve a score of Restricted I or Pass on the ITA test in order to serve as a TA. See here for the ICC description of ITA results: <http://www.cmu.edu/icc/testing/ITA/ITAscoring.shtml>.

Requirements for Non-Native English Speakers:

- Attend an ICC Language Support Orientation immediately upon arrival to CMU : <http://www.cmu.edu/icc/language/training/checkin.shtml>.
- Achieve score of Restricted I or Pass on the ITA test in order to receive a TA assignment.

Ph.D. students must complete two TA assignments as a requirement for their degree. Students who receive a score of Restricted II or Not Qualified will not be permitted to TA without improving their score to Restricted I (or better). Students who are unsuccessful in multiple attempts to improve their ITA score may petition the GEC to obtain alternate TA arrangements. The following must be demonstrated:

- The student has made significant efforts to improve English language proficiency including:
 - 25-35 hours per semester of documented ESL-related study. This ESL study must be performed in every semester the student is enrolled until a score of Restricted I or Pass is achieved on the ITA test. ESL Resources include workshops at the ICC or locally in Pittsburgh:
<https://www.cmu.edu/icc/language-training/index.html>
<http://www.cmu.edu/icc/family/index.shtml>
- At least one additional attempt at the ITA test to achieve Restricted I status (must receive ICC approval to retake the test)
- If the petition is granted, the student must attend a minimum of 28 hours of ICC language classes concurrent with their TA assignment

Regardless of ITA test score, the MechE department strongly encourages all non-native speakers of English to take additional workshops and seminars to help improve their English language skills. This is especially important if you are interested in employment in the United States or in a university setting. The ICC offers many resources to help improve language (<https://www.cmu.edu/icc/language-training/index.html>) and we strongly suggest taking advantage of these services while at CMU.

4.3.11 Thesis Proposal and Defense Committee

In addition to the thesis advisor, each Ph.D. student must develop a Ph.D. thesis committee. The Ph.D. committee is developed in consultation with the Ph.D. advisor and oversees the student's research experience. Through the proposal, annual committee meetings, and the defense, the committee monitors the student's progress. At each of these meetings the student presents his or her research and responds to the committee members' questions.

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The committee provides an outside perspective on the student's research, helps the student to structure their research, and identifies research opportunities. The committee is responsible for approving both the student's research proposal and the final dissertation.

The thesis committee must include:

- At least 4 members
- At least 1 CMU MechE faculty member (full or jointly-appointed)
- At least 1 additional CMU MechE faculty member (full, jointly-appointed, courtesy, or adjunct)
- At least 1 member outside CMU MechE

The precise timing of the thesis proposal meeting is at the discretion of the advisor and student, but cannot take place until after the student passes the qualifying exams. Most Ph.D. students form a thesis committee and conduct the proposal between years two and three of entering the Ph.D. program. The thesis proposal meeting is an important milestone marking the end of the initial phase of research.

Ten days prior to the thesis proposal meeting, the student must provide the committee members with a written prospectus for the thesis research that includes a literature review motivating the problem, a description of preliminary results, and a description of the proposed research plan. Format for the prospectus is at the discretion of the thesis committee. At the thesis proposal meeting the student will give an oral presentation of the proposed thesis research, and is questioned by the committee on the proposed research plan and related subjects.

After a thesis proposal meeting has been held and committee recommendations are considered, the student's advisor submits an email to the Graduate Program Administrator and the Graduate Committee Chair indicating the date of the thesis proposal, the members of the thesis committee, and the outcome of the proposal exam (including follow-up if the exam was not successful).

After the formal proposal, it is strongly recommended that thesis committee meetings be held approximately once per year until the final thesis defense.

On rare occasions, it may be necessary to replace a thesis committee member. Please submit a petition to the GEC with the details of the change including why the change is necessary and who will replace the original committee member.

4.3.12 Thesis Defense and Thesis Submission:

Students should make an appointment with the Graduate Program Administrator the semester BEFORE they are planning to defend. The Graduate Program Administrator will review the degree requirements with the student to identify any requirements that remain to be completed. **Students have the responsibility of ensuring that their records are correct and up to date.**

Students should provide a complete, draft copy of their Ph.D. thesis to their committee at least two weeks before the defense. The exact timing is at the discretion of the committee and the student's advisor, but two weeks is typical. This allows the committee time to review the document before the public defense.

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Prior to the public defense, students will receive a committee signature page from the graduate administrator. The committee signature page should be brought to the defense so that it can be signed by the committee. Any committee members attending via teleconference should send an email to the graduate administrator in lieu of signature. Immediately after the defense, the signed committee page must be returned to the graduate program administrator.

The Defense is a formal presentation, open to the public, and includes a question and answer period. After the public defense, the committee will typically request revisions to the thesis document. Students should make these changes in consultation with their faculty advisor. The faculty advisor will verify that the thesis revisions are made. When the changes are complete, the following must be provided to the graduate administrator (unless otherwise indicated):

- At least one signature page signed by the faculty advisor(s)
- Two unbound copies of the dissertation (may be double-sided and in color if necessary). In the case of a co-advised student, then three unbound copies should be provided.
- CPDC graduation career survey
- Final thesis submission to ProQuest online

After the student submits all of the proper documentation, the graduate administrator will submit the thesis to the Department Head and then to the CIT Dean. After the thesis has been signed and approved, the student will be certified with the Ph.D. degree.

Copies of the thesis will be sent to the bindery and distributed as follows: one copy for the student and one copy for the faculty advisor(s). Additional bound copies can be purchased at the student's expense. (The student must also provide extra unbound copies of the document.) After certification, the thesis will be retained by the following parties: ProQuest, the CMU library, the advisor, and the student.

On rare occasions, a student may not pass the defense or pass with provisions. Details for a second defense or resubmission of the thesis will be provided in writing if necessary. If a student does not meet the full Ph.D. requirements, including passing the defense and submitting the final thesis, an M.S. degree (MSME) may be granted provided that the student has completed or will complete the necessary M.S. requirements in one additional semester.

There are strict deadlines that must be followed in regard to the final submission of the dissertation. Please check with the graduate administrator to obtain the dates pertaining to August, December, or May graduation.

4.3.13 Yearly Review

The Ph.D. Annual Report is required each year and is typically completed during the Summer. The report allows the student to reflect upon their progress in the past year and to plan for the upcoming year as they work towards their Ph.D. It also allows the advisor(s) to understand the student's progress and

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expectations, and gives an opportunity for the student to receive valuable feedback that will help them make the most of their Ph.D. degree.

The Annual Report form contains a series of short-answer questions. There are no length requirements or limitations for responses. Once the form is completed, the student should upload it to their MechE Box folder, and then email their advisor(s). The advisor(s) then have the option to provide written feedback, but must sign the form and re-upload to Box. Only the student, advisor(s), and the Graduate Program Administrator have access to each respective Box Folder.

The Annual Report must be completed each year to maintain good standing. Unfavorable reviews may be discussed with the advisor(s), the Graduate Program Administrator, head of the Graduate Education Committee, or the Department Head. There is no mechanism to re-evaluate the yearly review.

4.3.14 Seminar

The MechE Department offers a seminar speaker series in the Fall and Spring semesters. Distinguished speakers are invited from both inside and outside the CMU community to discuss topical issues in engineering and research. There are typically 7 or 8 seminar speakers each semester. All full-time Ph.D. students are required to attend seminar each semester. To register, please use 24-791 section A.

Seminar is worth 0 (zero) units and students will be granted an S-grade (Satisfactory) or an N-grade (Non-Pass) based on attendance. There are no other academic requirements (no tests or papers) associated with seminar. Students may miss one seminar each semester and still receive a satisfactory grade. (Seminars offered during university break periods are considered optional.) To earn credit for attending, students enter a code in Canvas. Failure to enter the code during the allotted seminar time will result in a missed seminar for that week.

Students who miss more than one seminar may attend a make-up seminar (maximum of two per semester). Make-up seminars may be attended in one of the following pre-approved departments: all engineering departments, machine learning, robotics, human computer interaction, computer science, and the natural sciences – biology, chemistry, physics, and math. MechE may also advertise pre-approved make-up seminars throughout the semester. To receive credit for attending a make-up seminar, please submit a brief 1-2 paragraph summary of the make-up seminar attended to Canvas.

Seminar waivers may be granted for students in extenuating circumstances: examples include conflicts with another CMU course, university-related travel (such as for research or for a conference), or for medical reasons. Please alert your academic advisor or the Graduate Program Administrator if you believe you qualify for a seminar waiver for any reason.

4.3.15 CITI Research compliance course

The following is a MANDATORY REQUIREMENT of all MechE Ph.D. students:

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In an effort to increase awareness and compliance of research ethics, the CIT Dean's Office requires all personnel (students, faculty, post-docs) involved in research activities to pass the Collaborative Institutional Training Initiative (CITI) research ethics training course. This is a mandatory requirement of all MechE Masters & Ph.D. students, faculty, and post-docs. You need only pass the course once. Students must complete the course by the end of the first month of their first semester.

To complete the CITI on-line education course go to [CITI's website](#). Create an account and select Carnegie Mellon University as your "organization." Once your registration is complete, you will be directed to a list of courses. Please choose the following course under Responsible Conduct of Research (RCR):

- Physical Science Responsible Conduct of Research Course

Some helpful hints on navigating through the course:

- For the question: "Do you anticipate requesting CMU/CEU credits for the course?" Answer: No
- For "Institutional Email Address" please enter your Andrew email. For "Department" please enter "Mechanical Engineering."
- Please complete "The Integrity Assurance Statement" before beginning the course.
- After submitting the integrity statement, you should be directed into the research ethics course itself. Please read the material, watch the videos and answer the subsequent test questions. **A score of 80% is needed to pass.**

The course may take a few hours to complete. You may save your test at any time and return to it later. When you complete the course, CITI will e-mail your completion record to you. In order to receive credit for passing the course, please forward your completion email to the MechE receptionist.

You may take the course as many times as necessary until you pass. Again, passing the course is a mandatory requirement of all MechE grad students, faculty, and post-docs. No exceptions!

4.3.16 Residency Requirement

A minimum of one year of residency is required for the Ph.D. degree. Residency is defined as registering full-time (at least 36 units) in two consecutive semesters.

4.3.17 Expected Timeline for Meeting Milestones

The timeline to take the qualifying exams is the beginning of the second year of Ph.D. The timeline for other milestones (courses, proposal, TA, final thesis defense) is at the discretion of the student and their advisor(s).

4.4 OTHER PH.D. PROGRAMS

The department also offers joint Ph.D. programs with other departments at Carnegie Mellon and with other universities.

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4.4.1 Joint Ph.D. degree with Engineering and Public Policy (EPP)

The Mechanical Engineering Department currently has an active joint Ph.D. with Engineering and Public Policy (EPP). A student interested in a joint PhD in Mechanical Engineering and EPP must successfully complete two semesters of the PhD program in either department before being eligible to apply to the Joint PhD. Current students in the PhD program in EPP will need to submit an official application for the PhD program in Mechanical Engineering. Current students in the PhD program in Mechanical Engineering should contact the EPP department for additional information.

- **Course Requirements:** To obtain a joint degree, the student must meet all course requirements for both departments (except that research units are taken in the student's home department). A course that satisfies both a MechE requirement and an EPP requirement may be double-counted.
- **TA Requirements:** The EPP teaching requirement is currently 1 semester teaching practicum, and the MechE teaching requirement is currently 2 semesters of TA service. A joint PhD student may fulfill their obligations with 1 semester of teaching service to each department.
- **Qualifying Exams:** A joint student would need to pass the qualifying exams of each department. (See individual department qualifying exam descriptions for information about the exams and timing).
- **Home Department:** The department into which the student is originally accepted will be the student's home department. Financial items will be managed by the home department, and research units will be registered through the home department. The home department will provide all space and administrative support.
- **Advising:** A joint student must have an advisor in each department (could be the same person for jointly appointed faculty).
- **Proposal and Defense:** Only one proposal exam, final defense and dissertation will be required for the joint degree. The PhD committee must satisfy the committee requirements of both departments.
- **Seminar Requirement:** A joint PhD student may satisfy up to half of the MechE seminar requirement by attending relevant EPP seminars and submitting "make-up" forms on the MechE seminar website.

4.4.2 Ph.D. partnership with A*STAR

The department currently collaborates with the [Agency for Science, Technology and Research \(A*STAR\)](#), on the A*STAR-CMU Partnership Ph.D. Programme (ACMP). This collaboration focuses on the areas of high performance computing and manufacturing, two important areas of research for both Carnegie Mellon and A*STAR. Memorandums of understanding were signed between the department and the two relevant A*STAR institutes, [Institute of High Performance Computing \(IHPC\)](#) and [Singapore Institute of Manufacturing Technology \(SIMTech\)](#).

ACMP is a four-year scholarship comprising approximately two years of Ph.D. studies at Carnegie Mellon, and two years at a relevant A*STAR Research Institute (RI) in Singapore. Ph.D. research training will be

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carried out under the joint supervision of a CMU Professor and a senior member of an A*STAR RI. Successful students will be awarded a Ph.D. degree by CMU. Specifics of the program are detailed on the A*STAR [ACMP webpage](#).

4.4.3 Collaborative Ph.D. degree with the Max Planck Institute (MPI) in Stuttgart, Germany

The Mechanical Engineering Department currently has an active collaborative Ph.D. program with the [Max Planck Institute \(MPI\)](#) in Stuttgart, Germany. To attain a collaborative degree through this program, students must:

- Apply to Carnegie Mellon's MechE Ph.D. and choose the MPI collaborative program.
- Be admitted to Carnegie Mellon University (CMU) only.
- Be supervised by two research co-advisors, one from CMU (MechE) and one from MPI.
- Spend a minimum of 1.5 academic years in residence at CMU.
- Satisfy all the requirements for CMU's Ph.D. Degree in Mechanical Engineering (either Advanced Entry or Direct Entry as appropriate), including passing all examinations and meeting all course and research requirements. Note: only one TA assignment is required for the MPI collaborative program.
- During initial CMU residency, students must complete: all course requirements, the qualifying exams, one TA assignment, and the thesis proposal.
- Must change to ABS status (All But Dissertation in Absentia) prior to residency at MPI.
- Spend a minimum of 2 academic years in residence at MPI after completing all CMU requirements except the thesis defense.
- Required to return to CMU during the final semester to defend and graduate.
- Must switch from ABS to standard ABD (All But Dissertation) and pay for 5 units of tuition in the final semester.
- Upon the successful completion of all the requirements, a Ph.D. degree from Carnegie Mellon will be awarded.

5. Advising

5.1 STUDENT-PROFESSOR RELATIONSHIP AND ADVISING

Every admitted student in the Ph.D. program conducts research with a specific MechE (full time or courtesy) faculty member who serves as the student's faculty advisor. The faculty advisor guides the student through the entire Ph.D. process including course selection, research, and selection of the research committee. This faculty member serves as the chair of the thesis committee and often provides a Research Assistantship to the student.

Advising is monitored by the Graduate Program Administrator and the GEC. While Ph.D. students are responsible for ensuring that they are satisfying the requirements of their degree, the faculty advisor is responsible for providing feedback and guidance to ensure that research progress is made. All students must have a faculty advisor to maintain academic standing in the Ph.D. program.

- **Role of the Faculty Advisor:** To help guide the student through successful completion of the Ph.D. defense and thesis submission.
- **Role of the Graduate Administrator:** To help guide the student through the administrative aspects of the program from enrollment through graduation.
- **Role of the Student:** To ensure they satisfy the requirements of their degree.
- **How and When Advisors are Assigned/Selected:** All Ph.D. students are admitted with a faculty advisor. The name of the advisor is provided in the admission letter and agreed upon prior to enrollment.
- **Procedure for changing advisors:** In rare situations, students may wish to change faculty advisors. A student wishing to consider this possibility is encouraged to consult the graduate program administrator, the GEC chair, or the department head.

6. Financial Support

6.1 DEPARTMENTAL FINANCIAL SUPPORT

6.1.1 Research Assistantships

In the majority of cases, a paid Research Assistantship (RA) will be offered to Ph.D. students. RA's include a tuition fellowship, stipend, and the technology fee, and are typically provided by research grants and contracts that are funded by government agencies, private industries, and consortia. Ph.D. research assistants are expected to conduct appropriate research under the direction and guidance of their research advisor. A standard RA provides up to five years of support contingent upon maintaining good academic standing and making satisfactory progress towards degree completion. The payment schedule is semi-monthly (the 15th and the last day of each month). The stipend is subject to Federal taxes.

The RA is based upon the assumption that a student does not have funding available from another scholarship or fellowship (e.g. NSF GRFP, GEM, NDSEG, etc.). MechE encourages students to apply for these prestigious external awards. If you are successful, please alert the Manager of Academic Programs. The external fellowship will be applied to the academic expenses before any departmental financial support. In the event that a student is awarded an external fellowship and it does not fully cover the standard RA, the faculty advisor will supplement the external fellowship up to the standard RA. Supplementary funds for up to five years are contingent upon maintaining good academic standing and making satisfactory progress towards degree completion.

Ph.D. students who have not been admitted with an RA (rare) are encouraged to apply for external funding opportunities. Please review a list of opportunities: <http://www.cmu.edu/fso>.

6.1.2 Student Financial Responsibilities

Ph.D. students are responsible for some of the educational costs of the degree. These costs include health insurance, books and supplies, and the activity and transportation fees. Carnegie Mellon's current fee structure can be found at the [Enrollment Services website](#).

6.1.3 Employment in Addition to the Research Assistantship

Students who are receiving an RA either from their advisor or from the department are not permitted to obtain additional employment during the academic year or during the summer. Students who have a paid Summer internship must forfeit the RA during the internship if the internship pays the same or more than the standard RA. If the internship pays less than the standard RA, and the student is able to conduct additional research work related to their project, then the faculty advisor may supplement the stipend up to the standard RA. Volunteer positions are allowable with advisor permission.

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6.1.4 External Employment for Self-Supported Ph.D.

Self-supported Ph.D. students (i.e. those who receive no MechE Research Assistantship) may have outside employment. F-1 visa regulations stipulate that international students who have outside employment must maintain full time registration (at least 36 units) and may only work a maximum of 20 hours per week.

6.1.5 Travel/Conference Funding

Presenting research findings at conferences is an important part of the Ph.D. experience. Travel funding is provided by the Ph.D. faculty advisor through research grants. Students can also seek funding from the university through the Graduate Student Assembly (GSA) and the Office of the Assistant Vice Provost for Graduate Education. Information regarding the university application process for conference funding may be found here: <http://www.cmu.edu/graduate/professional-development/conference-funding/index.html>.

In the event that conference funding is not available from the faculty advisor or from the university, Ph.D. students may petition the MechE department for a one-time grant of \$500. Students must meet the following eligibility requirements:

- Current Ph.D. student
- Has not previously received travel/conference funding from the department
- Accepted to present at a conference/exhibition
- Applied for the university Graduate Student Conference Funding
- Advisor is supportive of the conference attendance

Students who meet the eligibility requirements should submit the following documents to the Graduate Education Committee (GEC), via the Graduate Program Administrator, to apply for conference funding:

- General Petition form (secured from the Graduate Program Administrator)
- Conference name and dates
- Short description explaining the relevance of the conference to the student's research area and how the conference will benefit the student
- Title of work being presented and proof of acceptance by the conference
- Budget outlining expenses and amount of funding requested. Expenses may include:
 - o Cost of travel to/from conference
 - o Conference registration fee
 - o Lodging and travel within the conference area
 - o Meals not provided by the conference
- Letter of support from faculty advisor including amount of travel/conference funding they are providing (or an explanation as to why they are unable to provide travel/conference funding)
- Results of the university Graduate Student Conference Funding application*

Conference applications must be submitted to the GEC according to the following schedule:

- Conferences between October 1 – December 31, 2019: Submit no later than September 20th

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- Conferences between January 1 – March 31, 2020: Submit no later than December 8th
- Conferences between April 1 – June 30, 2020: Submit no later than March 7th
- Conferences between July 1 – September 30, 2020: Submit no later than June 7th

*Applicants who have not received the results from their university Graduate Student Conference Funding application may submit proof of their application in lieu of the results.

If the funding is approved by the GEC, students can use the funds to book travel through an Administrative Coordinator or submit original receipts for reimbursement. Receipts must be provided upon return from the conference. Students are also required to submit a photo which shows them presenting or with their presentation material at the conference and a one-page written description of their experience at the conference.

6.1.6 Research Funding

Funding for materials and supplies, equipment, and other items needed to conduct the research is provided by the faculty advisor. GuSH Research Funding is an additional source of small research grant funds provided by the Graduate Student Assembly (GSA) and the Provost's Office and managed by the Office of the Assistant Vice Provost for Graduate Education. Students can find more information about the application process and deadlines on the Graduate Student Funding website: <https://www.cmu.edu/graduate/professional-development/index.html>.

6.2 POLICIES GOVERNING FUNDING FOR PH.D. STUDENTS ADMITTED WITH A RESEARCH ASSISTANTSHIP

Ph.D. students admitted to the Department with an RA are admitted to work with a specific faculty member who provides the financial support from his/her funds (grants, contracts, gifts, internal funds, etc.). The admission letter states that the RA will continue for “up to 5 years ..., contingent upon you maintaining good academic standing and making satisfactory progress toward completing the degree.” Therefore, there is one contingency with respect to continued funding of the Research Assistantship – academic progress.

Students enroll with the expectation that they will perform well academically and therefore will continue to receive the RA. The following policies describe the Department procedures when a student fails to maintain good academic standing or adequate progress towards the degree.

The policies described here only apply to students admitted to the Ph.D. program with financial support (i.e. the students whose admission letter says that he/she would receive an RA from their advisor).

6.2.1 Inadequate Academic Performance

The RA is contingent upon the student maintaining good academic standing and making satisfactory progress towards the degree. This section outlines the Department policies for situations in which a student fails to meet either of these contingencies.

Maintaining good academic standing includes having a Ph.D. advisor, maintaining a QPA ≥ 3.0 , passing the qualifier exam, completing the proposal, passing the defense, and following the Carnegie Mellon Code/Academic Integrity. Making adequate progress towards the degree includes completing course requirements and the qualifier/proposal/defense on a time table agreed to by the advisor, and meeting research milestones established in consultation with the advisor. Above all, students should continuously seek feedback from their advisor(s) on their performance so that corrective actions can be informally prescribed consistent with a healthy advisor-student relationship. There may be situations in which the advisor-student relationship is not working; a student must have an advisor to maintain good academic standing. In these rare situations, the student will need to find a new advisor to continue the Ph.D. program.

If a student fails to maintain academic standing or to make satisfactory progress towards the degree, they will be required to leave the Ph.D. program. Except in extreme situations (e.g. violations of the Carnegie Mellon Code), students must be put on academic probation prior to being removed from the program. The probationary period provides a transition and potentially a final chance for the student to address the shortcomings. The student will be notified that they have been placed on probation by a formal letter from the Department Head. This letter will briefly outline the issues, specify the date when the student will be required to leave the program, and list the action(s) that the student must take to be removed from probation. During the probation period, the student will continue to receive the Research Assistantship.

6.2.2 Withdrawal of Research Assistantship (RA)

If a student is admitted with an RA, then that student can only lose that support if they fail to maintain their academic standing. If a faculty member withdraws the RA based on the procedures described in section 6.2.1, then the faculty member can no longer serve as the student's advisor and the student can no longer work in that faculty member's research group. The only exception is if the student has been in the Ph.D. program for more than five years. After five years, the advisor can transition the student off the RA but continue to work with them to complete the degree. In the event that a Ph.D. student loses their advisor, MechE will assist the student with finding a new advisor. However, MechE does not guarantee that a MechE faculty member will be willing to serve as a student advisor.

International students should notify the Office of International Education (OIE) immediately upon losing funding. Graduate students who find themselves in need of immediate funds for emergency situations should contact the Office of the Dean of Student Affairs, www.cmu.edu/student-affairs/index.html, to inquire about an Emergency Student Loan.

6.2.3 Switch from Ph.D. to M.S.

Ph.D. students may switch from Ph.D. to M.S. at any time during their matriculation. A written letter of resignation to the faculty advisor and the Graduate Program Administrator is required at least two weeks prior to the switch of programs. Students admitted with an RA will lose the RA unless otherwise notified by the new M.S. research advisor, if applicable.

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6.3 UNIVERSITY FINANCIAL AID

Graduate students should consult the graduate student financial aid information found on The HUB website: <https://www.cmu.edu/sfs/financial-aid/graduate/index.html>. Students will find the Graduate Financial Aid Guide, information about funding options and how to apply for financial aid, and other helpful links.

Graduate students in need of immediate funds for emergency situations should contact the Office of the Dean of Student Affairs (see *Appendix B*), www.cmu.edu/student-affairs/index.html, to inquire about an Emergency Student Loan (<https://www.cmu.edu/student-affairs/dean/loans/>).

6.4 EXTERNAL FUNDING

6.4.1 U.S. Department of Education Resources

U.S. citizens and permanent residents may complete the Free Application for Federal Student Aid (FAFSA) on line at <https://fafsa.ed.gov/>.

Students may obtain information regarding their loans through the William D. Ford Direct Loan Program, including deferment forms and payment information, at <https://studentloans.gov/myDirectLoan/index.action>.

Information about the federal student aid programs may be found at <https://studentaid.ed.gov/sa/>.

6.4.2 Additional Loan Resources

Grad PLUS

Effective July 1, 2006 a graduate or professional student may be eligible to borrow a Federal Graduate PLUS Loan. This loan allows you, not your parents, to borrow up to the cost of attendance less any other financial aid you receive. You must be a US citizen or permanent resident to qualify.

You must complete a FAFSA and have applied for your annual loan maximum eligibility under the Stafford program first. You will also have to complete a Master Promissory Note (MPN) and Addendum for this loan.

Private Loans

Students who need additional funds have the option to borrow funds through a private lender. These loans are credit based, so applicants may need a cosigner. International students may utilize private lenders if they have a US citizen or permanent resident as a cosigner.

FASTChoice is a loan comparison serviced offered free-of-charge to schools by the Great Lakes Higher Education Corporation. Private loan options are available for both students and parents. You can access FASTChoice through the HUB's website: <https://www.cmu.edu/sfs/financial-aid/types/private.html>

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6.4.3 Other Resources

The following websites are available for researching other sources of financial aid. Please pay attention to any stated application deadlines.

- <http://www.finaid.org/>
- <https://mycollegeinfo.com/public/home.aspx>
- https://www.fastweb.com/ppc?utm_source=bing&utm_medium=ppc
- <http://www.collegenet.com/mach25/app>
- [College Board Scholarship Search](#)
- [Fastaid.com](#)
- [Fellowship Resources Compiled by the Soros Fellowship](#)
- National Association of Fellowship Advisors: <http://www.nafadvisors.org/home>

6.4.4 Additional Sources of Financial Aid for International Students

The following information is designed to help international students in the search for additional sources of financial aid.

Grants and scholarships

Institute of International Education (IIE)

The IIE is a nonprofit organization that promotes international education. They provide information about the Fulbright Program on their website: <http://www.iie.org/>. Number and amount of grants differs from country to country. They also publish several useful guides, including *Funding for US Study: A guide for Foreign Nationals*, *English Language Orientation Programs* (a guide to ESL programs in the US), and *Academic Year Abroad*. Books can be ordered through e-mail to iie-books@iie.org.

Ford Foundation International Fellowship Program (IFP)

The Foundation sponsors three minority graduate fellowship programs - predoctoral, doctoral, and postdoctoral - through the National Research Council.

The IFP provides support for up to three years of formal graduate-level study. Fellows will be selected from countries in Africa and the Middle East, Asia, Latin America, and Russia where the foundation maintains active overseas programs. U.S. nationals are not eligible, although fellows may study in the United States. IFP Fellows must be nationals of eligible countries. For more detailed information concerning the application process, eligible candidates, and IFP requirements, please refer to: <http://www.fordfoundation.org/>.

Links

International students may find the information on these websites helpful in researching funding sources:

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- <http://www.internationalscholarships.com/>
- <http://www.edupass.org/>
- <https://educationusa.state.gov/>
- [Native Leadership Scholarship \(women only\)](#)
- <http://www.onsf.uconn.edu/find-scholarships/opportunities-for-non-us-citizens/>

7. Department Policies

7.1 ACADEMIC INTEGRITY

MechE follows the University protocol on Academic Integrity, and expects all students to maintain academic integrity throughout their time in the department. Academic integrity accusations are extremely serious. Violations will be reviewed on a case-by-case basis and may result in discipline up to and including academic probation, suspension, or expulsion from the program. Disciplinary action will be discussed at the time of review (including the possibility of returning to good standing), and students may appeal by following the procedures outlined at the links below.

Please review the University Policy on Academic Integrity (<https://www.cmu.edu/policies/student-and-student-life/academic-integrity.html>). The policy includes the University expectations around academic integrity and provides definitions of cheating, plagiarism, and unauthorized assistance.

A review of the University's Academic Disciplinary Actions procedures (<https://www.cmu.edu/student-affairs/theword/academic-discipline/index.html>) is also recommended. These procedures outline the process for investigating, reporting, and adjudicating violations of the University Policy on Academic Integrity. The procedures also outline the appeal process.

University-Wide Protocol: <https://www.cmu.edu/policies/student-and-student-life/academic-integrity.html>

7.2 FULL & PART TIME STATUS

Students may be registered with full- or part-time status. Full-time status means a student is registered for at least 36 units (**with a maximum of 54 units (total) per semester**). Ph.D. students must be registered as full-time students to receive a Research Assistantship. Ph.D. students registered for less than 36 units are considered self-supported part-time and pay reduced tuition. (Please note: Faculty advisors are not permitted to provide a Research Assistantship for part-time students.)

Part-time students are not required to satisfy the seminar requirements of their degree.

Students who wish to switch from full-time to part-time enrollment must request approval from the Graduate Education Committee (GEC) by submitting a petition.

International Students: Note that immigration regulations do not allow Carnegie Mellon University to issue visa documents for a part-time program. International students registering in ABD status are considered full-time for immigration purposes regardless of the number of units.

7.3 DEPARTMENT REGISTRATION PROCESS AND PROCEDURES

For instructions, go to the [HUB Registration Website](#) and work through the four easy steps for registration. You will be asked to authenticate your identity with your Andrew ID and password.

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Use the [Schedule of Classes](#) to help prepare for registration. This link provides information on courses offered in the current, previous, and upcoming semesters.

For questions regarding registration please contact the graduate administrator:

<https://www.meetme.so/MechEAdvisors>.

7.4 COURSE RELATED POLICIES/PROTOCOLS

Please see the [Degree Requirements](#) section for course requirements specific to the Ph.D. Please note that course availability changes each academic year. For a current list of available courses, visit the [Schedule of Classes](#). For Add/Drop dates, please follow the [university academic calendars](#). Please note that Heinz College and Tepper courses follow a separate calendar.

7.4.1 Petition/Waiver Procedures

A student wishing to petition the GEC for special permission or special circumstances related to their degree, or for a waiver of degree requirements, must submit a formal petition form via email to the Head of the GEC. Official petition forms are available from the Graduate Program Administrators and require faculty advisor signature. The petition should outline the reason for the request, and provide any relevant supporting information (course descriptions, syllabi, etc.).

Please note: The GEC does NOT accept petitions to count non 24-### courses towards the MechE course unit requirements. Only courses offered from the MechE department or cross-listed within MechE (i.e. courses that start with 24-###) may count toward the MechE course-unit requirement.

7.4.2 Policy for Incompletes

If a student receives an "Incomplete" grade on their transcript, they must work with the course instructor to make up the work necessary to receive a letter grade for the class. All "incomplete" grades are submitted with a default grade. The default grade is automatically processed as the final grade if the instructor does not supply the University with an alternate grade (via the "Change of Grade" form) by the last day of class the following academic semester (this does not include summer). For appeals, please see the [Summary of Graduate Student Appeal and Grievance Procedures](#) section of this handbook.

7.4.3 Policy for Withdrawal Grade ('W' Grade) in a Course

If a student drops a class after the course drop deadline, but before the last day of the class, they will receive a "W" (withdrawal) grade for the course. Students may also be withdrawn from a course for failing to provide adequate attendance. "W" grades do not factor into the student's QPA, and cannot be removed from the transcript.

7.4.4 Policy for Make-Up Exams

Make-up exams may be provided at the discretion of the teaching faculty for the course in question.

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7.4.5 Drop/Add/Withdraw Procedures

Students taking undergraduate and Master's level courses must follow the procedures and deadlines for adding, dropping, or withdrawing from courses as identified on the academic calendar. Information can be found at <https://www.cmu.edu/hub/registrar/course-changes/index.html>. There is a separate calendar for doctoral level courses which can also be found at the above webpage.

7.5 ACADEMIC PROBATION

Ph.D. students whose QPA drops below 3.0, or who are not making adequate progress toward their degree, or who have committed an integrity violation, will be placed on academic probation. The Department Head shall provide a formal written notice of probation with clear instructions on how the student can regain good academic standing. The probationary period will be specified in the letter. Registration will be restricted and the student must meet with their faculty advisor before registering for courses for the upcoming semester.

Failure to regain good academic standing may lead to removal from the program.

7.6 GRADUATE CERTIFICATION PROCESS AND DEGREE TITLE

The Graduate Program Administrators will review each student's record to verify graduation eligibility. If all degree requirements have been satisfied (including defense and thesis submission to the department), the student will be certified with a Doctoral degree after the final grading period of the graduation semester.

- Students in all of the MechE Ph.D. programs will receive a Doctor of Philosophy in Mechanical Engineering.

Students who have not defended (or have defended but have not submitted their thesis to the department) by the semester certification deadline must register for the following semester. Tuition may be waived if students are certified by a certain date (September 30 for Fall and February 28 for Spring), but students will be charged and must pay university fees (technology, transportation, and activity fees) and health insurance. Stipend may continue to be available through the above dates (September 30 for Fall and February 28 for Spring) at the faculty advisor's discretion.

8. Additional University Policies/Protocols

8.1 GRADES AND GRADING

The Mechanical Engineering Department follows the CIT and CMU policy for grading.

- For information on the CIT grading policy and QPA requirements, Please see this link:
<https://engineering.cmu.edu/education/academic-policies/graduate-policies/registration-grading-credit.html>.
- For more information on CMU grading policies, please see this link:
<https://www.cmu.edu/policies/student-and-student-life/grading.html>.

CMU's grading policy offers details concerning university grading principles for students taking courses and covers the specifics of assigning and changing grades, grading options, drop/withdrawals, and course repeats. It also defines the undergraduate and graduate grading standards.

Research work may be given an S (Satisfactory) grade on a semester-by-semester basis, but a letter grade (A, A-, B+, B, B-, C+, C, C-, D+, D, or R) must be given in the final semester. The units with an S-grade are counted toward degree requirements but are not included in computing the average QPA.

For College of Engineering students, course work or research units with a grade of C- or lower are not acceptable toward graduate degree requirements. Grades of C- and below will remain on the CMU transcript and count toward the student's *university* QPA. Departmental QPA (the QPA used toward MechE degree requirements) will not be affected.

Courses taken as Audit or Pass/Fail may not be used toward graduation requirements for degree certification.

8.1.1 Policy on Retaking a Course

Students may retake any course where they have received a grade of C- or lower in an attempt to have the course count toward degree requirements. If a student receives a grade of C or above for the retake, the course may then be counted towards degree requirements. Only the grade of C or above will factor into the student's MechE QPA. Courses may only be retaken once.

8.1.2 Process for Appealing Final Grades

<https://www.cmu.edu/graduate/policies/appeal-grievance-procedures.html>

Final grades will be changed only in exceptional circumstances and only with the approval of the instructor and the department, unit, or program. Grading is a matter of sound discretion of the instructor and final grades are rarely changed without the consent of the instructor who assigned the grade. The following circumstances are the unusual exceptions that may warrant a grade appeal: (a)

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the final grade assigned for a course is based on manifest error (e.g. a clear error such as arithmetic error in computing a grade or failure to grade one of the answers on an exam), or (b) the faculty or staff member who assigned the grade did so in violation of a University policy.

8.1.3 QPA

The MechE Ph.D. requires a QPA of 3.0 or above for successful academic standing and for graduation. For Ph.D., all factorable units (courses and research taken for a letter grade) shall be used to compute the QPA. If a student's QPA drops below 3.0, they are considered to be on probation. No student with a QPA below 3.0 at the time of graduation will have their degree certified or be permitted to graduate.

QPA Calculation: The QPA is calculated only with courses, supervised reading (24-793), or research (24-797) taken for a letter grade and used to satisfy degree requirements. Audit courses, withdrawn courses, or courses or research taken as audit or pass/fail are not included in the QPA calculation. "A" is the highest grade possible. A+ does not exist.

A = 4.0

A- = 3.67

B+ = 3.33

B = 3.0

B- = 2.67

C+ = 2.33

C = 2.0

8.2 INTERNSHIP IN MECHANICAL ENGINEERING (24-995)

Ph.D. students completing an internship or co-op may register for 3 units of 24-995 Internship in Mechanical Engineering (does not count as course units). The internship or co-op must be integral to the student's curriculum. Students must provide the Graduate Program Administrator with an offer letter from the hiring company that includes the title of the internship or co-op and the job duties to be performed. The faculty advisor and/or Ph.D. Subcommittee Chair will determine if the internship or co-op is integral to the student's curriculum based on the offer letter from the hiring company. Additional information may be required if the offer letter does not clearly reflect how the position is integral to the student's curriculum. Once registered for the course, students must submit a written report (1-2 pages) to the faculty advisor and the Graduate Program Administrator detailing the nature of the job duties and how their experience relates to their MechE degree. The report should be signed by the student's internship supervisor. Students will receive a pass/fail grade (S or N) for 24-995 based on the written report.

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While most internship and co-op experiences happen during the summer semester, it is also possible to have an internship or co-op experience during the regular academic year (Fall or Spring). The policy stated above still applies.

The CMU Career and Professional Development Center (CPDC) is a great resource for students searching for employment opportunities. International Students may be required to secure work authorization and should consult with the Office of International Education (OIE) to determine their work authorization needs and options.

8.3 AUDIT AND PASS/FAIL COURSES

CMU students are permitted to take classes for no credit via the audit or pass/fail process. Students must register for the course and submit the appropriate form with signatures to the HUB. Both audit and pass/fail courses require academic advisor and department head approval. Audit courses require instructor approval as well.

Course work or graduate project units with a grade of C- or lower are not acceptable toward graduate degree requirements in the College of Engineering. In the event that a student elects to take a course as pass/fail and an instructor enters a letter grade, any letter grade of C- or lower will be converted to Fail, while any letter grade A through C will be considered Pass.

Audit and pass/fail courses do not count toward degree requirements, and do not factor into the QPA calculation.

Students should consult their academic advisor with any questions before selecting to take a course as audit or pass/fail.

Audit and Pass/Fail forms may be found [here](#) under the “Registration” tab.

8.4 PITTSBURGH COUNCIL ON HIGHER EDUCATION (PCHE) COURSES

Carnegie Mellon University offers students the opportunity to take courses for credit at other colleges or universities in the Pittsburgh area through a cross-registration program offered through the Pittsburgh Council on Higher Education (PCHE). The Carnegie Mellon University transcript will include information on such courses as follows: Courses taken through the university's cross-registration program will have grades recorded on the transcript and be factored into the QPA. A maximum of one course per semester may be taken through PCHE. Students must be registered full time at CMU (at least 36 units) and must have enough room available in their course schedule to add the PCHE units.

PCHE Cross-Registration Information can be found at:
<https://www.cmu.edu/hub/registrar/registration/cross/>.

8.5 TRANSFER COURSES

Carnegie Mellon University offers students the opportunity to receive transfer credit from other accredited institutions. The Carnegie Mellon University transcript will include information on transferred courses as follows: Carnegie Mellon courses and courses taken through the university's cross-registration program will have grades recorded on the transcript and be factored into the QPA. All other courses will be recorded on this transcript indicating where the course was taken, but without grade. Such courses will not be taken into account for academic actions, honors or QPA calculations. (Note: suspended students may take courses elsewhere, and may receive transfer credit based on the petition process outlined below.)

University Transfer Policies can be found [here](#).

College of Engineering Transfer Policies can be found [here](#).

8.5.1 Transfer Policy (for courses taken at a university other than CMU excluding courses taken through PCHE)

Note: University policy supercedes Department policy.

- Decisions on transfer credit are made by the GEC. Students who wish to receive transfer credit for courses completed while not enrolled as a graduate student in MechE must petition the GEC. The petition should include the following material: course description, transcript documenting grade, analogous CMU course for which the course will be transferred, syllabus, student work product (assignments, projects), and the reason for the transfer request. Official petition forms are available from the Graduate Program Administrators and require faculty advisor signature.
- Transfer credit may only be granted if the course(s) taken is from an accredited institution.
- A maximum of two course (up to 24 units) of graduate course work completed with a grade of B or better at another university may be given transfer credit provided that such course work is part of the graduate program leading to the degree sought and the course was not counted toward any other degree received by the student.
- A transfer course must be analogous to a CMU course the student has not taken.
- Transferred courses appear on the student's transcript as the analogous CMU course with a transfer designation added.
- For a transferred course to count as MechE units, it must be analogous to a course found in the MechE department.
- Course units transfer, but grades do not.
- Transfer credit is not granted prior to admission. Transfer credit may be granted after the student has successfully completed at least 36 units of graduate course work at CMU.
- Transferred courses must be "technical" courses (equivalent to a course that may be found in any engineering department, the natural sciences, computer science, robotics, machine learning, human-computer interaction, etc. at Carnegie Mellon). Courses that are non-technical in nature (humanities, fine arts, business, management, etc.) will not count toward graduation requirements and cannot be transferred for use toward the MechE degree.

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- Transfer Grades (for courses taken at other departments at CMU): Students may transfer courses and grades from other internal CMU departments taken prior to enrolling in the MechE Ph.D. program provided that the courses and grades meet the degree requirements and have not been used to fulfill requirements for another degree.
- Distance Education – The department does not accept distance or online education credits.

8.6 ASSISTANCE FOR INDIVIDUALS WITH DISABILITIES

The Office of Disability Resources at Carnegie Mellon University has a continued mission to provide physical and programmatic campus access to all events and information within the Carnegie Mellon community. We work to ensure that qualified individuals receive reasonable accommodations as guaranteed by the Americans with Disabilities Act (ADA) and Sections 503 and 504 of the Rehabilitation Act of 1973. Students who would like to receive accommodations can begin the process through Disability Resources secure online portal or email access@andrew.cmu.edu to begin the interactive accommodation process.

Students with disabilities are encouraged to self-identify with the Office of Disability Resources by contacting Catherine Getchell, 412-268-6121, getchell@cmu.edu to access the services available at the university and initiate a request for accommodations.

8.7 INTELLECTUAL PROPERTY

Students enrolled in the Department of Mechanical Engineering are expected to adhere to the Intellectual Property guidelines as set forth by the university: <https://www.cmu.edu/policies/administrative-and-governance/intellectual-property.html>

8.8 ACADEMIC CONFLICT

Graduate students are expected to discuss any concerns or grievances initially with members of their academic departments, including their academic advisor and Department Head, as appropriate. If a student wishes, the Associate Dean for Academic Affairs of the College of Engineering is available for consultation. All such discussions will be considered confidential at the request of the student.

If resolution of an academic grievance or concern cannot be obtained within the academic department, a graduate student may file a formal appeal of academic actions to the Associate Dean for Academic Affairs of the college. In accordance with the Carnegie Mellon Student Handbook, such appeals will ordinarily be heard and decided by the CIT (Engineering) College Council.

Written materials and findings of such appeal processes are considered confidential for all parties involved.

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If a resolution cannot be reached by this process, an appeal may be made to the Provost at the request of either the student or the college.

8.9 SUMMARY OF GRADUATE STUDENT APPEAL AND GRIEVANCE PROCEDURES

Graduate students will find the Summary of Graduate Student Appeal and Grievance Procedures on the Graduate Education Resource webpage:

<https://www.cmu.edu/graduate/policies/appeal-grievance-procedures.html>.

This document summarizes processes available to graduate students who seek review of academic and non-academic issues. Generally, graduate students are expected to seek informal resolution of all concerns within the applicable department, unit, or program before invoking formal processes.

When an informal resolution cannot be reached, a graduate student who seeks further review of the matter is to follow the formal procedures outlined here. These appeal and grievance procedures shall apply to students in all graduate programs of the University. Students should refer to the department specific information in this handbook for department and college information about the administration and academic policies of the program (See *Academic Integrity*)

8.9.1 Resources for Exceptional or Challenging Situations

Students may confer with the university graduate ombudsperson, Suzie Laurich-McIntyre, slaurichmcintyre@cmu.edu, on issues of process or other concerns as they navigate conflicts. Suzie Laurich-McIntyre is the Assistant Vice Provost for Graduate Education.

Examples of situations where students are encouraged to seek advice or assistance from the university graduate ombudsperson include:

- Difficulty in communications with advisor, particularly when those difficulties may lead to considering changing advisors or leaving the program
- Conflict with other group members that is difficult to resolve within the group
- Issues related to diversity or the departmental climate for those in groups who are historically underrepresented in STEM, or
- Personal concerns that interfere significantly with the ability to make timely progress in research or program requirements. These might be due to health, family, or financial challenges.

Upon the student's request, information shared will be kept in confidence, as long as no laws require otherwise. Should help be needed from additional sources, the student would be asked before sharing confidential information.

In the event that a difficulty cannot be resolved within the department, the ombudsperson can also assist with following the grievance procedures for resolving difficult matters, which are available here:

www.cmu.edu/graduate/policies/appeal-grievance-procedures.html.

8.9.2 Steps in Grievance procedure

- Student provides formal, written petition of grievance to both the academic advisor and faculty member.
- If resolution of an academic grievance or concern cannot be obtained at the faculty level, students may file a formal appeal at the department level with the Department Head.
- If resolution of an academic grievance or concern cannot be obtained at the department level, graduate students may file a formal appeal of academic actions to the Associate Dean for Graduate and Faculty Affairs of the college. In accordance with the Carnegie Mellon Student Handbook, such appeals will ordinarily be heard and decided by the Engineering College Council. Written materials and findings of such appeal processes are considered confidential for all parties involved.
- If a resolution cannot be reached by this process, an appeal may be made to the Provost at the request of either the student or the college.

8.10 SAFEGUARDING EDUCATIONAL EQUITY: POLICY AGAINST SEXUAL HARASSMENT AND SEXUAL ASSAULT

The University prohibits sex-based discrimination, sexual harassment, sexual assault, dating/ domestic violence and stalking. The University also prohibits retaliation against individuals who bring forward such concerns or allegations in good faith. The policy can be viewed in its entirety at: http://www.cmu.edu/policies/documents/SA_SH.htm. If you have been impacted by any of these issues, you are encouraged to make contact with any of the following resources:

- Office of Title IX Initiatives, <http://www.cmu.edu/title-ix/>, 412-268-7125, tix@cmu.edu
- University Police, 412-268-2323
- University Health Services, 412-268-2157
- Counseling & Psychological Services, 412-268-2922

Additional resources and information can be found at: <https://www.cmu.edu/title-ix/resources-and-information/resources.html>.

8.11 MATERNITY ACCOMMODATION PROTOCOL

<https://www.cmu.edu/graduate/programs-services/maternity-accommodation-protocol.html>

Students whose anticipated delivery date is during the course of the semester may consider taking time away from their coursework and/or research responsibilities. All female students who give birth to a child while engaged in coursework or research are eligible to take either a short-term absence or formal leave of absence. Students in coursework should consider either working with their course instructor to receive incomplete grades, or elect to drop to part-time status or to take a semester leave of absence. Students

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engaged in research must work with their faculty to develop plans for the research for the time they are away.

Students are encouraged to consult with relevant university faculty and staff as soon as possible as they begin making plans regarding time away. Students must contact the Office of the Dean of Student Affairs to register for Maternity Accommodations. Students will complete an information form and meet with a member of the Dean's Office staff to determine resources and procedures appropriate for the individual student. Planning for the student's discussion with her academic contact(s) (advisor, associate dean, etc.) will be reviewed during this meeting. Doctoral students who receive an academic stipend funded by Carnegie Mellon are eligible to continue to receive stipend funding for up to six (6) weeks during a Short-Term Maternity Accommodation or a Formal Leave of Absence. Continued academic stipend funding may be extended by two (2) weeks, for a total of eight (8) weeks, if an absence longer than six weeks is medically necessary. To receive this support students must be registered with the Office of the Dean of Student Affairs for a Maternity Accommodation.

8.12 CHANGE OF ADDRESS

Maintaining an updated address within the university system is important for receiving official college notices. MechE students are responsible for notifying the MechE department and HUB of all address changes in a timely manner. F-1 students may jeopardize their status if address information is not kept current.

Students can change their address using SIO: <https://www.cmu.edu/hub/sio/about.html>.

8.13 "GRANDFATHER" POLICY

When policies are changed it is because the department believes the new rules offer an improvement in the program and the educational experience; any such changes will be discussed with the GEC. However, students currently enrolled whose degree program is affected by a change in policy may choose to be governed by the older policy that was in place at the time of their matriculation. In the case that degree requirements are changed and certain courses are no longer offered, the department will work with the student to find a compromise that allows those students to satisfy the original requirements.

8.14 VACATIONS AND TIME-OFF

Students with graduate assistantships are expected to continue with their research during academic breaks (including the Summer months) with the exception of the official university holidays. A complete list of the official university holidays can be found below and at the [Human Resources website](#).

Due to federal regulations governing graduate student financial support, paid time off for personal business and vacations is not provided. A graduate student receiving a Research Assistantship who wants to take a one week break during one of the summer months in which they are receiving a stipend is

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expected to receive approval for that break from their advisor and make up the work during the other three weeks of that month. Graduate students who receive a Research Assistantship who wish to take longer periods of personal time off must do so without pay and must receive advanced approval from their research advisor a minimum of four weeks prior to the requested time off. The advisor must then notify the Graduate Program Administrator and Business Manager of this approval so that stipend adjustments can be processed.

8.14.1 University Holidays

- New Year's Day
- Martin Luther King Jr. Day
- Memorial Day
- Independence Day
- Labor Day
- Thanksgiving Day
- Day After Thanksgiving
- Day Before Christmas
- Christmas Day
- Day Before New Years Day

8.15 STATUTE OF LIMITATIONS

The Doctoral Student Status Policy is a series of policies that set forth a definition of All But Dissertation (ABD), time limits on doctoral candidacy status, a definition of *in residence* and *in absentia* status for ABD candidates and the tuition charged for candidates in each status. Students must complete all requirements for the Ph.D. degree within a maximum of ten years from original matriculation as a doctoral student. Once this time-to-degree limit has lapsed, the person may resume work toward a doctoral degree only if newly admitted to a currently offered doctoral degree program under criteria determined by that program. Before reapplying, students must first petition the GEC for permission to continue in the Ph.D. program. Official petition forms are available from the Graduate Program Administrators and require faculty advisor signature.

Under extraordinary circumstances, such as leave of absence, military or public service, family or parental leave, or temporary disability, a school or college may, upon the relevant department's recommendation and with the written approval of the dean, defer the lapse of All But Dissertation status for a period commensurate with the duration of that interruption. Students who are pursuing the Ph.D. degree as part-time students for all semesters of their program, as approved by their program, may also appeal to their program or department for extension of the time to degree limit.

Passing the Ph.D. Qualifying Examination admits a student to candidacy for the Ph.D. degree for a period of no longer than six calendar years. This time period includes any in absentia registration for those students who have completed all degree requirements other than formal submission of the thesis and who have left the Carnegie Mellon campus. More specific requirements for this period are discussed below. If, at the end of this six-year period, the Ph.D. has not been awarded, the student will cease to be a Ph.D. degree candidate. The student must then reapply to his or her department for admission to the graduate program and will be judged competitively with other students applying at the same time. A department may also require that the student petition the CIT College Council for permission to be readmitted. If the student is

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readmitted, he or she, at the discretion of the department, may be requested to once again pass the Qualifying Examination before the Ph.D. is awarded. A student may petition for extension of the six-year limit under extenuating circumstances such as a forced change of advisor, military service or prolonged illness. Any petition for extension must be made and approved during the last academic semester prior to the end of the six-year statute of limitations, and will only be granted for one calendar year at a time.

The six-year time limit will continue to pertain to students registering in absentia. It is anticipated that the total in absentia period will not exceed one calendar year. Refer to the [CIT Graduate Policies](#) for "all but dissertation (ABD)" and "in absentia" status.

8.16 WITHDRAWAL FROM PROGRAM & LEAVE OF ABSENCE

Please see The HUB's webpage for information on the Process for Withdrawal from Program and Taking & Returning from Leave of Absence: <https://www.cmu.edu/hub/registrar/leaves-and-withdrawals/>.

8.17 WITHDRAWAL OF DEGREE

The university reserves the right to withdraw a degree even though it has been granted should there be discovery that the work upon which it was based or the academic records in support of it had been falsified. In such a case, the degree will be withdrawn promptly upon discovery of the falsification. The complete reference to this university policy is available here: <https://www.cmu.edu/policies/student-and-student-life/withdrawal-of-a-degree.html>.

8.18 ENROLLMENT VERIFICATION

Enrollment Services is the only University office that can provide an official letter of enrollment, official transcript, and enrollment verification. Enrollment verification can be requested online through The HUB at: <https://www.cmu.edu/hub/registrar/student-records/verifications/enrollment.html>.

8.19 GRADUATION

The university has three graduation dates: May, August, and December. There is only one graduation ceremony (May). It generally takes several months to receive the August and December diplomas depending on when they are ordered through the registrar's office. Be sure to provide a complete mailing address in the on-line graduation information as well as to your academic advisor to ensure that the diploma is forwarded to you promptly after degree certification.

9. Appendix A: Department Resources

9.1 FACILITIES AND TECHNICAL SERVICES

The Mechanical Engineering department provides a variety of facilities to support our students, faculty, and affiliates.

Please view the MechE Grad Program Canvas Course (<https://canvas.cmu.edu/courses/1088>) for announcements, handbooks, forms, the academic calendar, alumni information, event calendars, department resources, advisor contact information, and more.

9.1.1 Office Assignments

Every Ph.D. student is assigned a desk, typically in a shared office suite. These assignments are made by the Graduate Program Administrator. Keys for offices require a \$5 deposit as well as permission from the research advisor and Graduate Program Administrator. Please consult the MechE receptionist (SH 402) for the Key Form.

After students are assigned an office space, it is their responsibility to keep the area clean and free of obstructions. Furniture should remain in the configuration that it is found—specifically in common areas.

Because other students generally share office space, courtesy must be practiced at all times. These are work areas and therefore, large personal belongings, such as bicycles, are not permitted in the office. There are bicycle racks located in front of Scaife and Hamerschlag Halls.

Students may occasionally be asked to switch desks, but generally office moves are kept to a minimum. Any changes to office assignments must be pre-approved and documented. Questions or concerns regarding office assignments should be directed to the Graduate Program Administrator.

9.1.2 Department Keys

Mechanical Engineering Department Building/Lab/Room keys are disbursed to enrolled graduate students with authorization of a faculty or staff member. Keys are recalled upon job termination, before graduation, or at the request of the authorizing faculty/staff member as appropriate. A \$5 cash deposit is required on all keys issued to graduate and post doctorates. The deposit is forfeited on keys lost or not returned. Please see the MechE Department Office (Scaife Hall 402) for a Key Request Form (the form must be signed by the appropriate faculty member if for a lab space) and pay the cash deposit to obtain a key.

9.1.3 Computing Services

MechE Computing Services and IT is maintained by the Electrical and Computer Engineering (ECE) department. Personal computing or MechE cluster-related questions and concerns may be directed to: help@its.me.cmu.edu. Please indicate that you are a student in MechE and the nature of your computing query.

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Questions or concerns regarding your Andrew ID or CMU email account should be directed to CMU computing services: it-help@cmu.edu. More information regarding CMU computing services may be found here: <http://www.cmu.edu/computing/index.html>.

9.1.4 Laboratories

MechE Faculty maintain state of the art research labs. To learn more about faculty labs, please visit each lab's web page.

9.1.5 TechSpark

College of Engineering students have access to a state of the art machine shop (known as TechSpark) to complete course projects. Students may be required to take one or more mini safety courses before using TechSpark. The mission is to provide a safe and innovative instructional workshop facility that serves College of Engineering students, researchers, staff, and faculty. We offer our students and researchers an opportunity to learn the “manufacturing side” of Mechanical Engineering making use of manual as well as cutting edge CAD/CAM/CNC, laser cutting/engraving, rapid prototyping machines, and 3D printing. Our staff brings many years of experience in prototyping to mentor our students and researchers through the process of design, fabrication and modification of prototypes bringing their ideas to life.

9.1.6 Computer Cluster

MechE students fulfill their computing needs in TechSpark's 40 seat teaching cluster or 12 seat collaborative cluster with Windows workstations having a wide variety of engineering software packages. Some courses are run in the teaching cluster, while the collaborative cluster is set up as pods of computers with TVs for screen sharing. Students may also use the public computer labs available across campus. All public computer labs are available for drop-in use 24/7 without appointment unless reserved. More information regarding CMU public computer labs may be found here: www.cmu.edu/computing/services/teach-learn/tes/computer-labs.

9.1.7 Shared Facilities

The department prides itself on the facilities it maintains for research and testing. University and outside researchers can use our facilities at the rates outlined on the [Shared Facilities](#) page.

9.1.8 Mailroom

Scaife Hall (SH) 408 has mailboxes assigned to faculty, staff, and graduate students. Each bin is shared by several grad students (alphabetical by last name), so please check your mail frequently to avoid overstuffed bins. Campus and regular mail is picked up from SH 408 daily around 9:00 a.m. Graduate students may have mail sent to:

Your name
c/o Department of Mechanical Engineering
Scaife Hall 402

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Carnegie Mellon University
5000 Forbes Avenue
Pittsburgh, PA 15213

9.1.9 Copy Machines and Fax Machine

The department offers the use of two Copy Machines and one Fax Machine, located in the Mailroom (SH 408), for all faculty, staff, and graduate students. Students may make any lab or course-related copies or send/receive a fax using these machines. Please see the MechE receptionist (SH 402) for instructions.

9.1.10 Reporting Damages/Request for Repairs/Security Concerns

To report damages, needed repairs, or security concerns regarding department facilities, please contact the MechE department technician, Ed Wojciechowski: 412-268-2516 or wojo@andrew.cmu.edu.

9.2 PURCHASING AND REIMBURSEMENT POLICIES AND PROCEDURES

9.2.1 Purchasing

The purchasing of research and lab supplies is handled by the Department's buyers (SH 423). There are many University and federal regulations that govern University spending. Students should contact the buyers with any questions they have regarding procedures. Note that most purchases over \$2,500 require competitive bidding in which a minimum of three bids must be obtained and a bid package completed before the purchase can be made. Please contact me-purchasing@andrew.cmu.edu for all purchase requests or general purchasing questions.

9.2.2 Reimbursements

All reimbursement requests must be submitted within 30 days from the date of purchase. Please refer to the Guidelines for Expense Reimbursements found on page two of the MechE Reimbursement Request Form prior to submitting your request. Please complete and submit the MechE Reimbursement Request Form along with the appropriate itemized receipts to the Administrative Coordinators for preparation. Receipts must be originals (not copies). A missing receipt form will be required for any receipts that are not itemized or original. All forms and guidelines will be available on [CANVAS](#). To view the complete policy on reimbursements, please see here: http://www.cmu.edu/finance/controller/bte/files/bte_policy.pdf.

9.3 PRESS & MEDIA RELATIONS

To assure consistency in all communications and to maximize external visibility to target audiences, the College of Engineering's marketing and communications team works together to disseminate key messages and foster media relations. This team works to maintain productive relationships with local, national and international media representing a variety of communication channels— newspapers, magazines, radio, television, blogs, and online news sites. Lisa Kulick (lkulick@andrew.cmu.edu), manager of

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communications, is a member of this team and the point-of-contact between internal and external news media and the Department of Mechanical Engineering.

To support and protect our students, we discourage them from communicating directly with the media (unless a specific media opportunity has been vetted and approved. In this instance, the manager of communications will media train the student and attend the interview to guide the student, redirect the reporter, and provide context and clarification as needed). Adherence to the communications policies of research funding agencies must be strictly followed. If a student (or faculty or staff member) is contacted by a media representative, they are required to inform the manager of communications (or another member of the college's marketing and communications team) prior to speaking with the media representative.

The communications team regularly develops news stories and multi-media for the MechE and College of Engineering websites as well as social media channels. The team can also publicize a program, project, or event via social media with appropriate lead time. Contact the manager of communications for more information.

9.4 DEPARTMENT/COLLEGE/UNIVERSITY BRANDS & LOGOS

Students interested in using the MechE unit mark, particularly for merchandise, should review the university's brand standards at: <https://www.cmu.edu/marcom/brand-standards/index.html> and contact either the academic programs coordinator or the manager of communications for more information. Use of university, college, and department logos, unit marks, and icons must follow the regulations of, and have been approved by, the [Trademark Licensing Office](#).

9.5 STUDENT ORGANIZATIONS

9.5.1 MEGSO

The Mechanical Engineering Graduate Student Organization (MEGSO) exists to enhance the graduate student life in the mechanical engineering department. MEGSO is a dedicated group of graduate students who organize academic and social events and serve as liaisons between the student body and the departmental administrators. Socially, MEGSO hosts happy hours, cookouts, recreational outings, and end of semester parties to facilitate informal interaction among students, staff, and faculty.

MEGSO is a valuable resource for student concerns and has a budget to implement appropriate projects. Please don't hesitate to contact MEGSO by email at megso@andrew.cmu.edu or on Facebook at <https://www.facebook.com/cmuMEGSO>

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9.5.2 GSA

For campus-wide student activities, the Graduate Student Assembly (GSA) hosts several events where you can connect with other Carnegie Mellon students. GSA has a presence on Facebook and Twitter.

Visit these links for more information about getting involved on campus:

- Graduate Education Office: <http://www.cmu.edu/graduate/>
- Office of Student Activities: <http://www.cmu.edu/studentactivities/index.html>
- Graduate Student Life: <http://www.cmu.edu/graduate/student-life/>
- Athletics & Fitness Facilities: <http://athletics.cmu.edu/landing/index>

10. Appendix B: Selected University Resources and The WORD, Student Handbook

10.1 KEY OFFICES FOR GRADUATE STUDENT SUPPORT

10.1.1 Graduate Education Office

www.cmu.edu/graduate; grad-ed@cmu.edu

The Graduate Education Office provides central support for all Master's and Doctoral students with a focus on their academic experience at Carnegie Mellon. Our goals are to support, advise and guide individual graduate students as they work to complete their degrees and to provide resources which will enhance their professional development experience.

Resources offered through the Graduate Education Office include- but are not limited to:

- Website with university resources, contact information for CMU programs and services, calendar of events related to graduate students
- Bi-monthly email to all graduate students with information on activities, resources and opportunities
- Professional Development Seminars and Workshops
- GSA/Provost Conference Funding Grants
- GSA/Provost Small Research Grants (GuSH)
- Consultations on all issues related to the graduate student experience

The Graduate Education Office is directed by Suzie Laurich-McIntyre, Ph.D., Assistant Vice Provost for Graduate Education, who offers personalized consultations with graduate students to support their academic success, connects them with relevant resources, and clarifies university level policies.

The Graduate Education Office also works with the colleges and departments by informing and assisting in forming policy and procedures relevant to graduate students and working with departments on issues related to graduate students. Additionally we partner with many other offices and organizations, such as the Graduate Student Assembly, to support our graduate students' advancement.

10.1.2 Office of the Dean of Students

<https://www.cmu.edu/student-affairs/dean>

The Office of the Dean of Students provides central leadership of the metacurricular experience at Carnegie Mellon including the coordination of student support. Vice President of Student Affairs and Dean of

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Students Gina Casalegno leads the division of student affairs which includes the following offices and departments (not an exhaustive list):

- Athletics, Physical Education and Recreation
- Career and Professional Development Center (CPDC)
- Center for Student Diversity and Inclusion
- Cohon University Center
- Counseling & Psychological Services (CaPS)
- Dining Services
- Office of Community Standards and Integrity (OCSI)
- Office of Student Leadership, Involvement, and Civic Engagement (SLICE)
- University Health Services (UHS)
- Wellness Initiatives

Graduate students will find the enrollment information for Domestic Partner Registration and Maternity Accommodations in the Office of the Dean of Students or on their website. This Office also manages the Emergency Student Loan (ESLs) process. Emergency Student Loans are made available through generous gifts of alumni and friends of the university. The Emergency Student Loan is an interest-free, emergency-based loan repayable to the university within 30 days. Loans are available to enrolled students for academic supplies, medication, food or other expenses not able to be met due to unforeseeable circumstances.

The Office of Community Standards and Integrity provides consultation, support, resources and follow-up on questions and issues related to Academic Integrity:

<https://www.cmu.edu/student-affairs/ocsi/students/index.html>

College Liaisons are senior members of the Division of Student Affairs who work with departments and colleges addressing student concerns across a wide range of issued. College Liaisons are identified on the student SIO page in the Important Contacts list.

10.1.3 Center for Student Diversity and Inclusion

<https://www.cmu.edu/student-diversity/>

Diversity and inclusion have a singular place among the values of Carnegie Mellon University. The Center for Student Diversity & Inclusion actively cultivates a strong, diverse and inclusive community capable of living out these values and advancing research, creativity, learning and development that changes the world.

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The Center offers resources to enhance an inclusive and transformative student experience in dimensions such as access, success, campus climate and intergroup dialogue. Additionally, the Center supports and connects historically underrepresented students and those who are first in their family to attend college in a setting where students' differences and talents are appreciated and reinforced, both at the graduate and undergraduate level. Initiatives coordinated by the Center include, but are not limited to:

- First generation/first in family to attend college programs
- LGBTQ+ Initiatives
- Race and ethnically-focused programs, including Inter-University Graduate Students of Color Series (SOC) and PhD SOC Network
- Women's empowerment programs, including Graduate Women's Gatherings (GWGs)
- Transgender and non-binary student programs

10.1.4 Assistance for Individuals with Disabilities

<http://www.cmu.edu/education-office/disability-resources/>

The Office of Disability Resources at Carnegie Mellon University has a continued mission to provide physical and programmatic campus access to all events and information within the Carnegie Mellon community. We work to ensure that qualified individuals receive reasonable accommodations as guaranteed by the Americans with Disabilities Act (ADA) and Sections 503 and 504 of the Rehabilitation Act of 1973. Students who would like to receive accommodations can begin the process through [Disability Resources secure online portal](#) or email access@andrew.cmu.edu to begin the interactive accommodation process.

Students with disabilities are encouraged to self-identify with the Office of Disability Resources and request needed accommodations. Any questions about the process can be directed to Catherine Getchell, 412-268-6121, getchell@cmu.edu.

10.1.5 Eberly Center for Teaching Excellence & Educational Innovation

www.cmu.edu/teaching

We offer a wide variety of confidential, consultation services and professional development programs to support graduate students as teaching assistants or instructors of record during their time at Carnegie Mellon University and as future faculty members at other institutions. Regardless of one's current or future teaching context and duties, our goal is to disseminate evidence-based teaching strategies in ways that are accessible and actionable. Programs and services include campus-wide Graduate Student Instructor Orientation events and our Future Faculty Program, both of which are designed to help participants be effective and efficient in their teaching roles. The Eberly Center also assists departments in creating and conducting customized programs to meet the specific needs of their graduate student instructors. Specific information about Eberly Center support for graduate students is found at www.cmu.edu/teaching/graduatestudentsupport/index.html.

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10.1.6 Graduate Student Assembly

www.cmu.edu/stugov/gsa/index.html

The Graduate Student Assembly (GSA) is the branch of Carnegie Mellon Student Government that represents, and advocates for the diverse interests of all graduate students at CMU. GSA is composed of representatives from the different graduate programs and departments who want to improve the graduate student experience at the different levels of the university. GSA is funded by the Student Activities Fee from all graduate students. GSA passes legislation, allocates student activities funding, advocates for legislative action locally and in Washington D.C. on behalf of graduate student issues and needs, and otherwise acts on behalf of all graduate student interests. Our recent accomplishments are a testament to GSA making a difference, and steps to implementing the vision laid out by the strategic plan.

<https://www.cmu.edu/stugov/gsa/About-the-GSA/Strategic-Plan.html>.

GSA offers an expanding suite of social programming on and off-campus to bring graduate students from different departments together and build a sense of community. GSA is the host of the Graduate Student Lounge on the 3rd floor of the Cohon University Center- a great place to study or meet up with friends. GSA also maintains a website of graduate student resources on and off-campus. Through GSA's continued funding for professional development and research conferences, the GSA/Provost Conference Funding Program and GSA/Provost GuSH Research Grants are able to run, as managed by the Graduate Education Office. As we move forward, GSA will continue to rely on your feedback to improve the graduate student experience at CMU. Feel free to contact us at gsa@cmu.edu to get involved, stop by our office in the Cohon University Center Room 304 or become a representative for your department.

10.1.7 Intercultural Communication Center (ICC)

www.cmu.edu/icc/

[Jump to Appendix C](#)

The Intercultural Communication Center (ICC) is a support service for nonnative English speakers, both newly arrived international students as well as students who attended high school and/or undergraduate programs in the US. The ICC offers seminars, workshops, and 1-1 consultations that develop the language and cross-cultural skills needed to succeed in academic programs at Carnegie Mellon University. The ICC provides International Teaching Assistant (ITA) testing, a required test indicating a nonnative speaking TA has the language proficiency required to work with students in classes, labs or individual meetings. The ICC also supports International Teaching Assistants in developing fluency and cultural understanding to teach successfully at Carnegie Mellon University.

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10.1.8 Office of International Education (OIE)

<http://www.cmu.edu/oie/>

[Jump to Appendix C](#)

Carnegie Mellon hosts international graduate and undergraduate students who come from more than 90 countries. Office of International Education (OIE) is the liaison to the University for all non-immigrant students and scholars. OIE provides many services including: advising on personal, immigration, academic, social and acculturation issues; presenting programs of interest such as international career workshops, tax workshops, and cross-cultural and immigration workshops; maintaining a resource library that includes information on cultural adjustment, international education and statistics on international students in the United States; posting pertinent information to students through email and the OIE website, and conducting orientation programs.

10.1.9 Veterans and Military Community

<http://www.cmu.edu/veterans/>

Military veterans are a vital part of the Carnegie Mellon University community. Graduate students can find information on applying for veteran education benefits, campus services, veteran's groups at CMU, non-educational resources and international military service information through the Veterans and Military Community website. There are also links and connections to veteran resource in the Pittsburgh community. The ROTC and Veteran Affairs Coordinator can be reached at uro-vaedbenefts@andrew.cmu.edu or 412-268-8747.

10.1.10 Carnegie Mellon Ethics Hotline

<https://www.cmu.edu/hr/resources/ethics-hotline.html>

The health, safety and well-being of the university community are top priorities at Carnegie Mellon University. CMU provides a hotline that all members of the university community should use to confidentially report suspected unethical activity relating to areas below:

- Academic and Student Life
- Bias Reporting
- Environmental Health and Safety
- Financial Matters
- High-Risk Incident
- Human Resource Related
- Information Systems

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- Research
- Threat of Business Interruption
- Threat of Violence or Physical Harm
- Title IX

Students, faculty and staff can anonymously file a report by calling 877-700-7050 or visiting www.reportit.net (user name: tartans; password: plaid). All submissions are reported to appropriate university personnel.

The hotline is NOT an emergency service. For emergencies, call University Police at 412-268-2323.

10.1.11 Policy Against Retaliation

It is the policy of Carnegie Mellon University to protect from retaliation any individual who makes a good faith report of a suspected violation of any applicable law or regulation, university Policy or procedure, any contractual obligation of the university, and any report made pursuant to the Carnegie Mellon University Code of Business Ethics and Conduct.

Additional details regarding the Policy Against Retaliation are available at <https://www.cmu.edu/policies/administrative-and-governance/whistleblower.html>

10.1.12 Consumer Information

Carnegie Mellon University suggests that all current and prospective students be informed consumers. Please see this link for detailed consumer information: <https://www.cmu.edu/hub/consumer-information/>.

10.2 KEY OFFICES FOR ACADEMIC & RESEARCH SUPPORT

10.2.1 Academic Coaching/Consulting—The Office of Academic Development

<https://www.cmu.edu/acadev/coaching/index-grad.html>

The Academic Coaching Program is a student assistance program that supports graduate students in the development and/or improvement of skills, strategies, and processes that are necessary for a productive and successful experience at CMU and beyond. Support for graduate students comes in two forms: Individualized Sessions and Group Workshops. Individualized Sessions are the primary focus and can be best understood as working with a personal consultant. Academic Coaches/Consultants meet with students regularly, in a one-on-one capacity, in order to assess a student's needs and implement strategies

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to satisfy those needs, while providing a variety of support throughout the process. Areas of focus include, but are not limited to:

- Self-Management
 - Developing and/or adjusting your organizational system
 - Managing time and combating stress and procrastination
 - Prioritization and decision making
 - Advancing mindset, self-efficacy, and belongingness
 - Balancing coursework, research, and professional development opportunities
- Study Skills
 - Identifying and modifying your learning process
 - Metacognition
 - Test-taking and note-taking strategies
 - Content comprehension and retention

10.2.2 Computing and Information Resources

www.cmu.edu/computing

Computing Services maintains and supports computing resources for the campus community, including the campus wired and wireless networks, printing, computer labs, file storage, email and software catalog. As members of this community, we are all responsible for the security of these shared resources. Be sure to review the Safe Computing (<https://www.cmu.edu/computing/safe/>) section and the University Computing Policy (<https://www.cmu.edu/policies/information-technology/computing.html>)

Visit the Computing Services website (<https://www.cmu.edu/computing/>) to learn more. For assistance the Computing Services Help Center is available at 412-268-4357 (HELP) or it-help@cmu.edu.

10.2.3 Global Communication Center (GCC)

<http://www.cmu.edu/gcc/>

[Jump to Appendix C](#)

The Global Communication Center offers free one-on-one tutoring and workshops for native and non-native English speakers from any academic discipline. Our tutors are trained to provide research-backed communication strategies on written, oral, and visual communication projects, in the sciences and the

humanities. We can help you improve the effectiveness of your communication in any academic project, including the following:

- Technical reports
- Dissertations
- Research posters
- Oral presentations
- Journal articles
- Grant proposals
- Class essays

You can visit us at any stage in the project—whether you are just getting started and need to talk through ideas or are putting the finishing touches on a final draft.

We also offer workshops on topics including crafting professional emails, team communication, PowerPoint slide design, data visualization, and job application materials.

For more information, to view our resources, or to schedule an appointment, visit our website.

10.2.4 Research at CMU

www.cmu.edu/research/index.shtml

The primary purpose of research at the university is the advancement of knowledge in all fields in which the university is active. Research is regarded as one of the university's major contributions to society and is an essential element in education, particularly at the graduate level and in faculty development. Research activities are governed by several university policies. Guidance and more general information is found by visiting the Research at Carnegie Mellon website.

10.2.5 Office of Research Integrity & Compliance

www.cmu.edu/research-compliance/index.html

The Office of Research Integrity & Compliance (ORIC) is designed to support research at Carnegie Mellon University. The staff work with researchers to ensure research is conducted with integrity and in accordance with federal and Pennsylvania regulation. ORIC assists researchers with human subject research, conflicts of interest, responsible conduct of research, export controls, and institutional animal care & use. ORIC also consults on, advises about and handles allegations of research misconduct.

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10.3 KEY OFFICES FOR HEALTH, WELLNESS & SAFETY

10.3.1 Counseling & Psychological Services

<http://www.cmu.edu/counseling/>

Counseling & Psychological Services (CaPS) affords the opportunity for students to talk privately about issues that are significant for them in a safe, confidential setting. Students sometimes feel uncertain about why they are feeling upset and perhaps confused about how to deal with those feelings. An initial consultation with a CaPS therapist will clarify options and provide a recommendation to the appropriate mental health resource at Carnegie Mellon or the larger Pittsburgh community. CaPS also provides workshops and group sessions specifically for graduate students on campus. CaPS services are provided at no cost. Appointments can be made in person or by telephone, 412-268-2922.

10.3.2 Health Services

www.cmu.edu/HealthServices/

University Health Services (UHS) is staffed by physicians, advanced practice clinicians and registered nurses who provide general medical care, allergy injections, first aid, gynecological care and contraception as well as on-site pharmaceuticals. The CMU student insurance plan covers most visit fees to see the physicians and advanced practice clinicians & nurse visits. Fees for prescription medications, laboratory tests, diagnostic procedures and referral to the emergency room or specialists are the student's responsibility and students should review the UHS website and their insurance plan for detailed information about the university health insurance requirement and fees.

UHS also has a registered dietician and health promotion specialists on staff to assist students in addressing nutrition, drug and alcohol and other healthy lifestyle issues. In addition to providing direct health care, UHS administers the Student Health Insurance Program. The Student Health Insurance plan offers a high level of coverage in a wide network of health care providers and hospitals. Appointments can be made by visiting UHS's website, walk-in, or by telephone, 412-268-2157.

10.3.3 Campus Wellness

<https://www.cmu.edu/wellness/>

At the university, we believe our individual and collective well-being is rooted in healthy connections to each other and to campus resources. The university provides a wide variety of wellness, mindfulness and connectedness initiatives and resources designed to help students thrive inside and outside the classroom. The BeWell@CMU e-newsletter seeks to be a comprehensive resource for CMU regarding all wellness-inspired events, announcements and professional and personal development opportunities. Sign up for the Be Well monthly newsletter via bit.ly/BeWellatCMU or by contacting the Program Director for Student Affairs Wellness Initiatives, at alusk@andrew.cmu.edu.

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10.3.4 Religious and Spiritual Initiatives (RSLI)

www.cmu.edu/student-affairs/spirituality

Carnegie Mellon is committed to the holistic growth of our students, including creating opportunities for spiritual and religious practice and exploration. We have relationships with local houses of worship from various traditions and many of these groups are members of CMU's Council of Religious Advisors. We also offer programs and initiatives that cross traditional religious boundaries in order to increase knowledge of and appreciation for the full diversity of the worldview traditions. Our RSLI staff are here to support students across the spectrum of religious and spiritual practice and would be more than happy to help you make a connection into a community of faith during your time at CMU.

10.3.5 University Police

<http://www.cmu.edu/police/>

412-268-2323 (emergency only), 412-268-6232 (non-emergency)

The University Police Department is located at 300 South Craig Street (entrance is on Filmore Street). The department's services include police patrols and call response, criminal investigations, fixed officer and foot officer patrols, event security, and crime prevention and education programming as well as bicycle registration. Visit the department's website for additional information about the staff, emergency phone locations, crime prevention, lost and found, finger print services, and annual statistic reports.

Carnegie Mellon University publishes an annual campus security and fire safety report describing the university's security, alcohol and drug, sexual assault, and fire safety policies and containing statistics about the number and type of crimes committed on the campus and the number and cause of fires in campus residence facilities during the preceding three years. Graduate students can obtain a copy by contacting the University Police Department at 412-268-6232. The annual security and fire safety report is also available online at <https://www.cmu.edu/police/annualreports/>.

10.3.6 Shuttle and Escort Services

Parking and Transportation coordinates the Shuttle Service and Escort Service provided for CMU students, faculty, and community. The Shuttle & Escort website has full information about these services, stops, routes, tracking and schedules.

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10.3.7 The WORD

<http://www.cmu.edu/student-affairs/theword//>

The WORD is Carnegie Mellon University's student on-line handbook and is considered a supplement to the department (and sometimes college) handbook. The WORD contains campus resources and opportunities, academic policy information and resources, community standards information and resources. It is designed to provide all students with the tools, guidance, and insights to help you achieve your full potential as a member of the Carnegie Mellon community. Information about the following is included in The WORD (not an exhaustive list) and graduate students are encouraged to bookmark this site and refer to it often. University policies can also be found in full text at: <http://www.cmu.edu/policies/>.

Carnegie Mellon Vision, Mission

Statement of Assurance

Carnegie Code

Academic Standards, Policies and Procedures

- Educational Goals

- Academic and Individual Freedom

- Statement on Academic Integrity

- Standards for Academic & Creative Life

 - Assistance for Individuals with Disabilities

 - Master's Student Statute of Limitations

 - Conduct of Classes

 - Copyright Policy

 - Cross-college & University Registration

 - Doctoral Student Status Policy

 - Evaluation & Certification of English Fluency for Instructors

 - Final Exams for Graduate Courses

 - Grading Policies

 - Intellectual Property Policy

 - Privacy Rights of Students

 - Research

 - Human Subjects in Research

 - Office of Research Integrity & Compliance

 - Office of Sponsored Programs

 - Policy for Handling Alleged Misconduct of Research

 - Policy on Restricted Research

 - Student's Rights

 - Tax Status of Graduate Student Awards

Campus Resources & Opportunities

- Alumni Relations

- Assistance for Individuals with Disabilities

- Athletics, Physical Fitness & Recreation

- Carnegie Mellon ID Cards and Services

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Cohon University Center
Copying, Printing & Mailing
Division of Student Affairs
Domestic Partner Registration
Emergency Student Loan Program
Gender Programs & Resources
Health Services
Dining Services
The HUB Student Services Center
ID Card Services
Leonard Gelfand Center
LGBTQ Resources
Multicultural and Diversity Initiatives
Opportunities for Involvement
Parking and Transportation Services
Shuttle and Escort Services
Spiritual Development
University Police
Student Activities
University Stores

Community Standards, Policies and Procedures

Alcohol and Drugs Policy
AIDS Policy
Bicycle/Wheeled Transportation Policy
Damage to Carnegie Mellon Property
Deadly Weapons
Discriminatory Harassment
Disorderly Conduct
Equal Opportunity/Affirmative Action Policy
Freedom of Expression Policy
Health Insurance Policy
Immunization Policy
Missing Student Protocol
Non-Discrimination Policy
On-Campus Emergencies
Pets
Political Activities
Recycling Policy
Riotous and Disorderly Behavior
Safety Hazards
Scheduling and Use of University Facilities
Sexual Harassment and Sexual Assault Policy
Smoking Policy
Student Accounts Receivable and Collection Policy and Procedures
Student Activities Fee
Student Enterprises

Workplace Threats and Violence Policy

11. Appendix C: Important Information and Resources for International Students

11.1 POLICIES TO NOTE:

International students should take special note of the following policies:

- Part-time status
- ITA Test
- Internships/Co-Ops
- ABS vs. ABD (and potential visa restrictions): In some circumstances, it may be necessary to complete the Ph.D. research outside of the main CMU campus in Pittsburgh. All students who are no longer residents in Pittsburgh must change their status to ABS (all but dissertation in absentia). International students in ABS status must terminate their SEVIS record and forfeit OPT.

11.2 RESOURCES TO NOTE:

International students should take special note of the following campus resources:

- Office of International Education (OIE)
- Intercultural Communication Center (ICC)
- Global Communication Center (GCC)

11.3 ESL RESOURCES

11.3.1 CMU – On Campus Program

ICC Language Program

<https://www.cmu.edu/icc/language-training/index.html>

The Intercultural Communication Center offers classes, workshops, and seminars to develop various aspects of academic fluency (e.g., pronunciation, fluency, grammar usage, presentation skills, academic writing, and cross-cultural understanding). They also offer self-paced work videos and websites to supplement ICC classwork.

11.3.2 Academic ESL Programs

University of Pittsburgh - English Language Institute (ELI)

<http://www.eli.pitt.edu/>

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Offers intensive fee-based programs for serious adults who want to improve their English for academic, professional or personal reasons. Options include classes in General English, English Pronunciation, TOEFL preparation, and evening courses for part-time students. University of Pittsburgh scholarships are available for eligible full-time faculty and research associates.

Duquesne University - English as a Second Language Program (ESLP)

<http://www.duq.edu/esl>

An academic support program that offers foreign students semi-intensive and intensive English for Academic Purposes (EAP). The ESL Program offers Duquesne's international foreign national students semi-intensive and intensive English for academic purposes.

Chatham University - English Language Program

www.chatham.edu/elp

Chatham University offers instruction in English to various levels of ESL students and provides a "bridge" through sheltered college classes to students who are striving to attain a high level of academic English level proficiency.

LaRoche College - English as a Second Language (ESL) Program

<http://www.laroche.edu/esl/>

The English As a Second Language (ESL) Program at La Roche College is designed to provide proficiency-based instruction in English for degree and non-degree seeking students, to promote students' participation in their chosen field, and to support adjustment to and participation in the life of the college and the community.

Pointe Park University - ELS Language Center

<http://www.els.edu/en/ELSCenters/Detail?locid=PIT>

The Language Center offers three month-long programs based on the intensity of instruction desired.

11.3.3 Private Tutors

Contact the ICC for a list of local ESL instructors available for private work (language training and editing). Phone: 412-268-4979.

11.3.4 Free Programs

Carnegie Library of Pittsburgh – ESL Programs

<http://www.carnegielibrary.org/services/for-language-learners/>

The Carnegie Library of Pittsburgh offers a variety of resources for non-native English speakers.

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Greater Pittsburgh Literacy Council

<http://www.gplc.org/our-programs.cfm>

Offers English classes at beginning, intermediate, and advanced levels.

Goodwill Literacy Initiative

<http://www.nationalliteracydirectory.org/goodwill-literacy-initiative>

This program offers beginning to advanced classes, class size limited to 6-10 students. In addition to an individualized study plan, a dedicated staff of tutors will assist students with college or job applications, cover letters, interviewing, recommendation letters, and other types of printed materials. We also offer computer laboratories with free email and Internet access. Students are encouraged to visit our Student Support Specialist, who assists our students in finding other student services such as housing, visas, health insurance, academic advising, and many others.

International Women's Association of Pittsburgh (IWAP)

<http://iwap-home.blogspot.com/>

The primary purpose of the group is to develop understanding and appreciation among peoples from different nations and cultures, and to assist international women in enjoying their stay in Pittsburgh and in the United States. They offer informal free conversation classes in English as a Second Language on Monday mornings (10 to 11:30 a.m.) at the Church of the Ascension. They also display in their website a complete list of English programs in Pittsburgh.

Pittsburgh Regional International Student Ministries-PRISM

<http://prismphgh.org/>

Designed especially for spouses of visiting students and scholars, introductory and intermediate instruction is offered on Bellefield Presbyterian Church, every Monday in the afternoons. No registration needed, \$1 donation each week, child care available (\$2 per child).

11.3.5 Intensive Regional Programs

Washington and Jefferson College English Language Institute (ELI)

<http://www.washjeff.edu/english-language-institute>

The English Language Institute at Washington and Jefferson College offers an intensive English for academic purposes program that prepares students both academically and culturally for undergraduate study in the United States.

West Virginia University - Intensive English Program (IEP)

<http://iep.wvu.edu/>

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The Intensive English Program in the Department of Foreign Languages at West Virginia University has become a well-established program for international students needing to improve their English proficiency prior to entering an academic course of study.

11.3.6 Online ESL Resources

Activities for ESL Students

<http://a4esl.org/>

This website offers grammar and vocabulary practice thorough quizzes and crossword puzzles.

Learn To Speak English

<http://www.mylanguageexchange.com/Learn/English.asp>

Find [pen-pals](#), practice written conversation using [text chat](#), and practice speaking using [voice chat](#).

Sounds of English

<http://www.soundsofenglish.org/>

This website offers pronunciation instruction and activities.

Learn English Vocabulary

<http://www.vocabulary.co.il/>

Play games to practice English vocabulary.

12. Appendix D: Overview of PhD Qualifying Exam

The purpose of the Ph.D. qualifying examination is to determine whether the student has the intellectual maturity, readiness, and ability to begin engaging in doctoral research. These abilities are assessed by testing:

- Fundamental knowledge in one core mechanical engineering discipline
- Competence in basic research methods and skills
- Ability to reason through and solve open-ended, unfamiliar problems
- Communication skills (writing, presenting, and responding to questions)

The qualifying examination consists of two individual examinations: one core subject exam and one research methods exam.

CORE SUBJECT EXAM

Each student chooses one subject from the following list: Controls, Design, Fluid Dynamics, Heat Transfer, Solid Mechanics, Thermodynamics, and Vibrations. A general description of the exam is given below. A more detailed summary of individual subject topics, relevant courses, and recommended textbooks can be found in Appendix A at the end of this document.

Each core subject exam is organized around open-ended, unfamiliar problems requiring significant modeling. The problem statement typically consists of a physical object or a written description and sketch of a device, and a series of questions. Problems often do not have numerical solutions and are therefore somewhat different than problems found on typical problem sets and exams. Solving the problem involves demonstrating to the committee an understanding of the critical issues behind the problem, identifying and justifying appropriate assumptions, applying relevant theory, and discussing the significance of the results. The problems have been designed to require the student to apply the core fundamentals of the discipline area; there are no trick problems.

Each individual exam is scheduled for a period of 80 minutes. The student is given the first 20 minutes to think about the problem and work on it using notepaper; the remainder of the time is the oral examination. During the oral portion of the exam, the student is expected to present and explain their solution to the faculty committee. Students write on a whiteboard/blackboard to support the oral presentation. The committee expects the student to think out loud and to explain their thought process to them.

The oral examination allows the committee, which is composed of three faculty members, to efficiently evaluate the extent of the student's knowledge in the exam area. Questioning is a critical component of this evaluation. Faculty will ask the student questions to clarify something said that was vague, to guide the student back onto the correct solution path, to explore an issue that arose during the presentation but

which remains open and unresolved, or to ask about some other aspect of the problem. Some of these questions will likely address topics beyond the written questions that are part of the problem statement.

One of the objectives of the subject qualifying exam is to identify the extent of the student's knowledge. Therefore, it is highly likely that the student will be asked questions to which they do not completely know the answer to. Students should not be concerned if they cannot answer some of the questions; it is part of the process. If the student does not know the answer to a particular question, they should tell the committee. Students should not try to bluff their way past a question: it is easy to ask follow-up questions to see if a student truly understands the subject matter.

The committee controls the pace of the exam. The committee may ask the student to stop working on some part of the problem and move on. This commonly occurs when the committee has decided that the student has adequately demonstrated their knowledge on a particular issue or that the student has run into a dead end. Moving on allows the student to demonstrate their knowledge in other areas.

RESEARCH METHODS EXAM

The goal of the research methods exam is to test whether the student understands and has demonstrated basic competence in the skills and methods required to carry out Ph.D.-level research. The research-methods exam is organized around a research project that the student has conducted during their first year at Carnegie Mellon University. The student is expected to demonstrate proficiency with the research method:

- Define the question:
 - What is the research problem being addressed and why is it potentially important?
- Gather background information
 - What are the known technical approaches and solutions to the problem?
 - What are the critical knowledge gaps?
- Form the hypothesis
- Perform experiments and/or analysis
 - What is the technical approach to test the hypothesis?
- Analyze data
- Interpret data and draw conclusions
 - Is the hypothesis supported by the data?
 - What is the unique contribution of the work?
 - How do the results compare with previous work?
 - What are the potential applications and positive impacts of the results?
- Publish/present results

Alternatively, the research method can be:

- Define the question

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- What is the research problem being addressed and why is it potentially important?
- Gather background information
 - What are the known technical approaches and solutions to the problem?
 - What are the critical knowledge gaps?
- Propose a new technical approach and solution to the problem
- Implement the proposed technical approach and solution
 - How should the proposed technical approach and solution be implemented?
- Analyze the performance of the implemented technical approach and solution.
- Interpret results and draw conclusions
 - Was the new technical approach effective?
 - What is the unique contribution of the work?
 - How do the results compare with previous work?
 - What are the potential applications and positive impacts of the results?
- Publish/present results

As part of the preparation for the research methods exam, the student should be aware of and ponder on these key questions. Recognizing that the student has been in the Ph.D. program for a short period of time, however, the exam committee does not expect that the student has the complete answers to all the key questions. The goal of the research methods exam is not an assessment of the research topic or the technical approach selected. For example, the committee will not assess whether the research topic selected is novel, insightful, or of high impact. The committee will not assess whether the research topic/project is Ph.D. level work or whether it has the potential to become a Ph.D. thesis. Indeed, it is not necessary that the selected research project becomes a part of the student's Ph.D. dissertation. Thus, there are some important differences between the qualifying examination and the thesis proposal.

The research exam consists of three components:

- (1) 10-page technical report
- (2) 20-minute technical presentation to the exam committee, consisting of three faculty members, and
- (3) 40 minutes of question and answer with the committee.

Written report: The written report consists of a 300-word summary of the student's research and a ten-page (maximum, including tables and figures) document describing the work on which the student's oral presentation is based. The report should clearly describe a research project that the student has worked on during their graduate program at Carnegie Mellon. Other specifications include:

- a. The **ten-page maximum** includes everything but the title page, 300-word summary, and citations to the technical literature. The 300-word summary functions as the abstract.
- b. Use one-inch margins at the top, bottom, left, and right.
- c. Use 12 point Times Roman font.
- d. Use double-spacing: no more than 23 lines per page (2.56 lines per inch).
- e. Number the pages

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The report should cover the following content:

1. **Abstract:** The abstract is a concise statement of the essential information in the report including problem statement, methods, major results, and conclusions. The abstract is probably the most important part of any report or paper.
2. **Introduction:** The introduction introduces the general problem area and provides a targeted review of the literature that identifies the critical gap(s) in knowledge that the report addresses. The introduction ends with a paragraph that states the goals of the research and describes the organization of the report.
3. **Methods:** The methods section discusses the techniques used to achieve the research goals. For experimental research, this includes a description of experimental setup, procedures, and analysis. For theoretical research, this includes description of mathematical relations and solution techniques. Previous literature should be cited.
4. **Results:** The results section describes the major results of the work, which are commonly presented graphically with accompanying text.
5. **Discussion:** The discussion section refers back to the results section, highlighting important aspects of the data already presented and synthesizing them in the context of the literature. The discussion and results section are sometimes combined.
6. **Statement of Contributions:** A brief, one paragraph (~1/4 page long) description of:
 - a The student's specific role in the research being presented.
 - b The contributions made by others to the research being presented.Carnegie Mellon has a vibrant, collaborative research environment, thus a large portion of research includes contributions of many individuals. The purpose of this section is not to inhibit the presentation of collaborative research results. It is to ensure that the committee understands the student's particular focus and to develop questions that are primarily targeted on those aspects. However, the student should exhibit adequate understanding of their collaborators' contributions and how these contributions are used or relate to their work. Keep in mind, many leading journal publications require similar statements of co-author contributions.
7. **Conclusions:** The conclusion is a brief statement covering the main points of the research. It should follow from the results and discussion and link back to the goal stated in the introduction.
8. **References (not part of 10 page limit):** Include complete references for citations in the text.

The report is expected to provide a well-written description of the student's research project. Writing the report helps the student improve their written communication skills and to organize their thinking on the research. It is not expected to be a peer-reviewed publication.

The date the written report is due will be announced well in advance of the exam.

There are many good texts that describe the contents of an effective technical research report. One possible reference is the Davidson, C. I. Ambrose, S. A. "The New Professor's Handbook." Anker Publishing, Bolton, MA, 1994.

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Technical Presentation: The oral portion of the exam begins with a 20-minute oral presentation by the student. The presentation should clearly describe a research project that the student has worked on during their graduate program at Carnegie Mellon and that is described in the written report.

In giving any technical presentation, it is important to understand the audience and to adjust the technical level accordingly. The exam committee consists of three faculty members drawn from different research areas. In consultation with your advisor(s), we are asking you to suggest three Department of Mechanical Engineering faculty members, in order of preference to sit on your committee for the qualifier exam. The reason for this is to provide an opportunity for the faculty closest to your research area to become better acquainted with you and your research. Although efforts are made during exam scheduling to include at least one faculty member with relevant background on the committee, the committee may not contain any faculty member who is an expert in the subject matter being presented. Therefore, the student should include introductory material that orients the audience to the topic being addressed and the content of the presentation. The preliminary makeup of the committee will be announced at least two weeks prior to the exam. However, there is always the possibility of last minute changes due to unforeseen changes in the availability of faculty.

The second slide of the presentation should include a brief summary of Section 6. Statement of Contributions from the written report.

There are many good texts that describe the contents of an effective technical presentation. One possible reference is the Davidson, C. I. Ambrose, S. A. "The New Professor's Handbook." Anker Publishing, Bolton, MA, 1994.

Question and Answer: After the 20-minute presentation, the committee will ask a series of questions to probe whether the student has:

- defined the problem statement of their project clearly, including providing adequate background information to define and support the topic selection, stating a clear scientific question and/or engineering approach, and stating a hypothesis.
- demonstrated an adequate knowledge of the literature and academic foundation underlying the research project,
- presented the technical approach clearly,
- articulated the motivation for or the potential impact/application of the research project, and
- evaluated and interpreted the results of the research project.

This question and answer section is the most important part of the exam. The major role of the other two components (report and presentation) is to set-up the question and answer portion of the exam. While the student can seek help in preparing the report and presentation, the question and answer period is when the student directly demonstrates their knowledge and abilities. The expectation is that the student's written report and presentations will be polished. Preparing the report and presentation are important exercises to help the students understand the research in order to be able to effectively respond to faculty

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questions. Poorly written reports and unclear presentations typically lead to poor performance in question and answer portion of the exam.

One of the objectives of the research methods qualifying exam is to identify the extent of the student's knowledge. Therefore, it is highly likely that the student will be asked questions to which they do not know or do not completely know the answer. Students should not be concerned if they cannot answer some of the questions, that is part of the process. If the student does not know the answer to a particular question, they should tell the committee. Students should not try to bluff their way past a question: it is easy to ask follow-up questions to see if a student truly understands the subject matter.

The committee also considers as part of their assessment of the student's performance how clearly and effectively the student communicates the content of the presentation and how clearly and effectively the student is able to respond to questions from the committee.

Role of advisor: The student's research advisor plays an important role in the research methods exam. They are involved with project selection and mentor the student as he/she conducts the research. Prior to the exam, the advisor may offer editorial comments and advice toward the student's written report, participate in practice talks, and offer advice toward the preparation of the student's oral presentation. However, the advisor may not write the report for the student, nor may the advisor prepare the presentation for the student. The student's research advisor may sit in on the research methods exam as a silent observer. The research advisor does not participate in the evaluation of the exam, but can discuss the student's performance with the committee immediately after the exam is completed.

PASS/RETAKE CRITERIA AND TIMING

Students must take the qualifying exams within one year after they start their Ph.D. program. Students not passing the qualifying exam the first time, i) will be provided with written feedback on their performance on each exam, ii) will be permitted to retake the exam once at the next offering of the examination; iii) will choose again one core subject from the exams offered (not necessarily the same subject); and iv) will be evaluated using the same criteria. Students are allowed to take the exam twice.

If a student passes only one of the two exams in the first round, they need to re-take only the retake one in the second round. The student must pass both exams independently – a strong performance in one of the exams does not offset a retake score in the other.

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Appendix A – Subject Exam Topic Summaries

Subject Exam	Topics	Relevant CMU Undergraduate and Graduate Courses	Textbook
Design	<p>Design Methodology: Customer needs, product function, engineering specifications, design for cost, manufacturing, assembly, materials, failure modes and effects analysis, design tools/methods including quality function deployment and Pugh's concept selection</p> <p>Design Analysis: Root finding, linear matrix equations, optimization, curve fitting, numerical integration and differentiation, ordinary differential equations, usage of numerical methods in modern computer aided design and engineering software</p>	<p>Design Methodology: 24-370 Engineering Design I AND 24-441 Engineering Design II</p> <p>Design Analysis: 24-311 Numerical Methods 24-703 Numerical Methods in Mechanical Engineering</p>	<p>Design Methodology: Dieter and Schmidt "Engineering Design"</p> <p>Design Analysis: Chapra, "Numerical Methods for Engineers"</p>
Fluids	Dimensional analysis and characteristic numbers, hydrostatics, viscous internal flows, integral solutions for control volume problems, differential flow analysis, flow visualization and plotting methods, Navier-Stokes solutions for internal viscous flows, potential and inviscid flow theory, Bernoulli's equation, head loss and fluid friction	<p>24-231 Fluid Mechanics</p> <p>24-711 Fluid Dynamics</p>	<p>White, "Fluid Mechanics"</p> <p>White, "Viscous Flow"</p>
Thermodynamics	Open system and closed system thermodynamic analysis, conservation of mass and momentum, first law of thermodynamics, second law of thermodynamics, rate-based analysis versus state based, psychrometrics, steam and ideal gas analysis methods, entropy generation, idealized standard	<p>24-221 Thermodynamics</p> <p>24-722 Energy System Modeling</p>	Moran and Shapiro, "Fundamentals of Engineering Thermodynamics"

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	cycle processes, major heat engine cycles, thermal efficiency, second law analysis		
Heat transfer	Mathematical formulation of heat transfer problems, dimensional analysis and characteristic numbers, heat conduction, thermal radiation, principles of convection, empirical and practical relations for convective heat transfer, hydraulic and thermal boundary layers, heat exchangers	24-322 Heat Transfer 24-730 Advanced Heat Transfer	Bergman, Levine, Incropera, and Dewitt, "Fundamentals of Heat and Mass Transfer" JP Holman, "Heat Transfer"
Solids	Statics of systems with prismatic and/or non-prismatic elements; force and moment balance of statically determinant systems; stress analysis for small strain pure axial, pure shear, flexural, and torsional loading conditions; small strain stress analysis for combined loading conditions; failure criteria for steel, aluminum, or other common engineering materials; 2D linear elasticity and Mohr's circle; definitions of 3D stress components;	24-261 Statics 24-262 Stress Analysis 25-751 Introduction to Solid Mechanics I	"Mechanics of Materials" by Paul Steif
Controls	Frequency domain and state space modeling of dynamic systems, block diagrams and components of feedback control systems, control system performance specifications (stability, transient response, and steady state error), analytical and graphical methods for analysis and design (root locus, Bode plot, and Nyquist criterion), design and implementation of PID and loop shaping controllers.	24-451 Feedback Control Systems	Franklin, Powell, and Emami-Naeini, "Feedback Control of Dynamic Systems"
Vibrations	Including (but not exclusively): Derivation of Equations of Motion; Vibration of 1DOF and Multi Degree of Freedom Lumped Parameter Systems; Mode shape and Natural	24-351 Dynamics 24-352 Dynamic Systems and Controls;	Fundamentals of Vibrations by Leonard Meirovitch System Dynamics (4th

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	Frequencies; Dynamic Vibration Isolation; Distributed parameter systems (strings and beams); Normal mode expansion; Frequency response functions (derivation of complex FRFs; finding steady-state solutions to harmonic and periodic functions); Eigenfunctions (mode shapes) and their orthogonality; State-space equations and their analytical solution; Transfer functions and transfer matrix; Analytical solutions for of 2 nd order system; Linearization; Energy Methods	24-752 Vibrations (similar course at CEE)	Edition) by Katsuhiko Ogata
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13. Appendix E: Math Requirement

13.1 LIST OF COURSES THAT SATISFY THE MECHE MATH REQUIREMENT:

Chemical Engineering

- 06-713 Mathematical Techniques in Chemical Engineering

Civil and Environmental Engineering

- 12-704 Probability and Estimation Methods for Engineering Systems
- 12-726/19-726 Mathematical Modeling of Environmental Quality Systems
- 12-755/24-755 Finite Elemental Method in Mechanics I
- 12-756 Finite Elemental Method in Mechanics II
- 12-758 Boundary Element Methods in Mechanics
- 12-759 Optimization in Mechanics

Electrical and Computer Engineering

- 18-660 Numerical Methods for Engineering Design and Optimization
- 18-751 Applied Stochastic Processes
- 18-771/24-771 Linear Systems

Engineering and Public Policy

- 19-726/12-726 Mathematical Modeling of Environmental Quality Systems

Mechanical Engineering

- 24-701 Mathematical Techniques in Mechanical Engineering
- 24-703 Numerical Methods
- 24-718 Computational Fluid Dynamics
- 24-755/12-755 Finite Elemental Method in Mechanics I
- 24-771/18-771 Linear Systems
- 24-785 Engineering Optimization

13.1.1 Other Miscellaneous Courses that Can be Used to Satisfy the MechE Math Requirement (added 5/9/02)

Robotics Institute

- 16-811 Mathematical Fundamentals for Robotics

University of Pittsburgh

Math courses at University of Pittsburgh may also count. However, the Graduate Education Committee (GEC) must approve the Pitt course as being analogous to a Carnegie Mellon course listed above.

Mechanism for Adding Courses to the Math List:

Students may petition the GEC to add a CIT course to the list. Please provide a statement from the instructor (course description or syllabus) as to the level of math content in the course. The math content must be 50% or more.

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- If the student has already passed a comparable graduate engineering math course as part of an MS program at another institution, they may petition the GEC for a waiver of the math requirement. See [Petitions/Waivers](#).

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14. Appendix F: Requirement Tracking Sheets

14.1 ADVANCED ENTRY PH.D. TRACKING SHEET

NAME		Advisor												Admitted		F11	
SSN																	

Course No.	Course Title	Semester	Grade	Units Carried	Factored Units	Qual Points	1) Course	2) Research/Project	3) Seminar	4) Teaching Assistant	5) Meche	6) Grad Level	Transfer	Date Approved	Trns No.	Course Transferred From	Funding
		TOTALS		0.0	0.0	0.00	0.0	0.0	0	0	0.0	0.0	0.0	7) QPA	#DIV/0!		

8) Qualifying Examination

Date	P or F

9) Residency Requirement

Semester

Thesis Proposal

Date	Committee Members

10) Thesis Defense

Date	Pass or Fail

no 1) Course Units ≥ 60 (600 or higher)

2) Research Units (24-797)

3) Seminar (24-791/92)

no 4) TA (24-795) ≥ 2

no 5) ME Course Units ≥ 36

no 6) Grad Level Course ≥ 60 (600 or higher)

7) QPA ≥ 3.0

8) Passed Qualls

9) Residency Requirement

10) Passed Defense (24-798)

Math Requirement (24-701 or 24-703)

**COURSE UNITS CANNOT INCLUDE SUPERVISED READING, INDEPENDENT STUDY OR RESEARCH

Title

Approved for Graduation	Date	Graduate Committee Chair

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14.2 DIRECT PH.D. TRACKING SHEET

NAME Advisor
ID #

Admitted

Course No.	Course Title	Semester	Grade	Units Carried	Factored Units	Qual Points	1) Course	2) Research/Project	3) Seminar	4) Teaching Assistant	5) MechE	6) Grad Level	Transfer	Date Approved	Trns No.	Course Transferred From	Funding
TOTALS				0.0	0.0	0.00	0.0	0.0	0	0	0.0	0.0	0.0	7) QPA	#DIV/0!		

8) Qualifying Examination

Date	P or F

9) Residency Requirement

Semester

Thesis Proposal

Date	Committee Members

10) Thesis Defense

Date	Pass or Fail

- no ☐ 1) Course Units ≥ 96
☐ 2) Research Units (24-797)
☐ 3) Seminar(24-791/92)
no ☐ 4) TA ≥ 2 (24-795)
no ☐ 5) ME Course Units ≥ 48
no ☐ 6) Grad Level Course ≥ 96
☐ 7) QPA ≥ 3.0
☐ 8) Passed Quals
☐ 9) Residency Requirement
☐ 10) Passed Defense (24-798)
☐ Math Requirement

Title

**COURSE UNITS CANNOT INCLUDE SUPERVISED READING, INDEPENDENT STUDY OR RESEARCH
 ** COURSES COUNTED TOWARDS DEGREE MUST BE (600-(12 units) level or Higher)

Approved for Graduation

Date

Graduate Committee Chair

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