



**A. JAMES CLARK**  
SCHOOL OF ENGINEERING

**Department of Mechanical Engineering**

**Graduate Handbook**

**2019-2020**

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# PH.D. MECHANICAL ENGINEERING DEGREE REQUIREMENTS

## Coursework

The Ph.D. Plan of Study sets forth the entire program of study that will be undertaken to satisfy the course requirements for the doctoral degree. The Plan of Study must be compiled in consultation with the student's advisor, who must approve the coursework plan. The plan should then be submitted to the Graduate Office of the Department of Mechanical Engineering for approval by the Director of Graduate Studies in the first semester of study. In exceptional circumstances plan of study may need to be approved by the Graduate Committee as well. Should this be the case, the Graduate Committee will receive the plan by email and will make a collective decision regarding the outcome.

Changes to the plan are permitted but must be approved by the student's advisor, the Director of Graduate Studies, and for any special exceptions, the Graduate Committee prior to their implementation. A new plan reflecting the changes must be filed with the Graduate Office of the Department of Mechanical Engineering every time a change is made.

The Ph.D. Plan of Study for Mechanical Engineering must contain a minimum of 36 credits of graduate coursework. A minimum of 12 credits of coursework must be taken at the University of Maryland as a Ph.D. student. Students with a master's degree from another accredited institution may, upon approval of the student's advisor and the Director of Graduate Studies, transfer and include up to 24 credits of graduate coursework into their Plan of Study. Plans that include graduate work completed at other academic institutions must be accompanied by appropriate documentation (transcripts/course description) to verify the level of work and to confirm that the work will not be duplicated by the courses that will be taken at the University of Maryland. All credits must be derived from courses taken at the 600-level or above. In rare circumstances, 400-level courses may be allowed as a graduate course by prior approval, only if taken in accordance with the advisor's recommendation when no graduate equivalents exist. Coursework plans that include such 400-level courses must be accompanied by a statement from the advisor justifying the recommendation and a statement from the instructor that the course was taken at the graduate level. No ENME or ENRE 400-level course can be part of the graduate Plan of Study. Requests for exemptions for 400-level courses from other interdisciplinary programs (outside of ENME/ENRE) may be given consideration, if no graduate equivalent exists, provided the request is accompanied by: (i) a statement from the advisor justifying the recommendation; and (ii) a statement from the instructor that the course was taken at the graduate level.

The coursework plan should contain a minimum of 6 credits in mathematics. Courses that satisfy this requirement are:

1. MATH, STAT or AMSC 600-level and higher.
2. Any one of the following:
  - a. ENME 605: Advanced Systems Control
  - b. ENME 610: Engineering Optimization
  - c. ENME 625: Multidisciplinary Optimization

- d. ENME 700: Advanced Mechanical Engineering Analysis I
- e. ENME 725: Probabilistic Optimization
- f. ENME 745: Numerical Methods in Engineering
- g. ENRE 620: Mathematical Techniques of Reliability Engineering
- h. ENRE 655: Advanced Methods in Reliability Modeling

## **Seminar Requirement for Satisfactory Progress**

In addition to coursework, all on-campus full-time Ph.D. students are required to attend a minimum of eight seminars in each of the fall and spring semesters. The list of seminars attended by the student must be approved by the advisor at the end of the semester, and that approval will be necessary in addition to other metrics for satisfactory progress in the program. Off-campus and part-time doctoral students are encouraged to attend seminars, whenever possible, and share this information with their respective doctoral advisors.

## **Dissertation Committee**

Functions of the Dissertation Committee include conducting the dissertation-proposal review, conducting the final review of the dissertation, advising and aiding students in completing the program of study, advising the student in the research activity as necessary, and evaluating the student's progress. The Dissertation Committee is formally nominated through the completion of the Nomination of Thesis or Dissertation Committee Form, available online at

[https://gradschool.umd.edu/sites/gradschool.umd.edu/files/uploads/nomination\\_of\\_thesis\\_or\\_dissertation\\_committee\\_form.pdf](https://gradschool.umd.edu/sites/gradschool.umd.edu/files/uploads/nomination_of_thesis_or_dissertation_committee_form.pdf)

### **The Doctoral Defense Committee:**

The Committee must consist of a minimum of five members, at least three of whom must be Full Members of the University of Maryland College Park Graduate Faculty who are on tenured or tenure-track appointments. Each Dissertation Examining Committee will have a chair, who must be a Full Member of Graduate Faculty, or, by special permission, has been appointed by the Dean of the Graduate School. Each Dissertation Examining Committee must also have appointed to it a representative of the Dean of the Graduate School. The Dean's Representative should have some background or interest related to the student's research; be from a department other than the student's; must have a tenure home that is different than the Chair of the Committee; and must be a tenured Member of the Graduate Faculty. Each member of the Committee must be a member of the Graduate Faculty of UMCP. Upon nomination by the Director of Graduate Studies and approval by the Dean of the Graduate School, individuals serve in addition to the three required Regular Members. To nominate a Special or Associate Member to serve, submit the nominee's curriculum vitae to the Graduate Office. Graduate Faculty who terminate employment at UMCP (and who do not have emeritus status) retain their status as members of the Graduate Faculty for twelve months, and during that time may serve as members and chairs of Dissertation Examining Committees, but not as the Dean's Representative. If granted Special

Member Status, however, they may serve as co-chairs. Professors Emeriti and Emeritae may serve on the Dissertation Examining Committees if they have retained their membership in the Graduate Faculty.

### **Graduate Faculty Categories:**

In general, Full Members are faculty who are tenured or on tenure-track appointments. Associate Members include the many scholars on campus in research appointments; as visiting, adjunct or affiliated professors who may appropriately serve on thesis or dissertation committees. The Special membership category recognizes outstanding scholars, including many at government agencies in the area, who may not have any official affiliation with the campus but whom UMCP welcomes to participate on thesis and dissertation committees. Special members are given a renewable five-year appointment to serve on committees. To nominate an individual to serve as an Associate or Special Member, the student's advisor needs to submit to the Graduate Office the nominee's curriculum vitae prior to the proposal presentation.

Mechanical and Reliability Engineering students are expected to appoint their Dissertation Committee before their dissertation proposal is presented. To nominate the examining committee, the student must complete the Nomination of Thesis or Dissertation Committee Form and return it to the Graduate Office for approval and forwarding to the Office of the Registrar. Changes to a dissertation committee due to unavoidable circumstances can be made at any time, with the approval of the student's advisor, the Director of Graduate Studies, and the Office of the Registrar.

The advisor and student are notified in writing by the Office of the Registrar regarding approval of the nominated doctoral Dissertation Examination Committee and the Report of the Examining Committee Form is generated. Until the time of the student's dissertation defense, the Report of the Examining Committee form is kept in the student's file in the ME Graduate Studies Office.

For more detailed information please visit the Graduate School website at:

<https://academiccatalog.umd.edu/graduate/policies/doctoral-degrees-policies/#text>

## **Dissertation Proposal and Proposal Presentation**

The doctoral dissertation proposal is a formal presentation of the research the student plans to undertake as the basis for the Ph.D. dissertation. The dissertation proposal must be prepared in written form under the guidance of the student's prospective dissertation advisor, and presented for approval by the student's prospective dissertation committee. The purpose of the proposal presentation is for the dissertation examining committee to review the proposed research plan and provide feedback and advice to refine it.

A dissertation proposal will be considered to have been approved when signed by all committee members after the proposal presentation and submitted to the Graduate Office for inclusion in the student's file. The student's research should not be complete at this time, and the proposal presentation should not be treated as preparation for the final Ph.D. defense.

## **Proposal Format**

- Proposals need to be submitted to the committee members at least a week before the proposal presentation.
- Proposal format should follow the dissertation format of the Graduate School and it is preferable to have the material presented in single space with 12 point font.
- It is left open to the committee members to accept an electronic copy of the proposal.
- The program presentation should not be public, but the committee can extend invitations to outside parties of their choosing.
- The proposal presentation should last between 20 and 30 minutes and the total time of the proposal presentation meeting should be between 1 and 1.5 hours.
- The recommended format for the presentation is as follows:
  - Motivation
  - Literature survey
  - Problem statement
  - Proposed research
  - Roadmap and timeline for completion of dissertation
  - How to make the work more broadly useful: plans for publishing, data sharing, and software sharing.

In addition to the University requirements for composition of a dissertation committee, the Department of Mechanical Engineering requires that all dissertation committees for mechanical and reliability engineering doctoral students contain five full members (tenure or tenure-track) of the graduate faculty. Research faculty and outside scientists, who are Associate of Special members of the Graduate Faculty are permitted to sit on dissertation committees only in addition to the five full members of the graduate faculty.

As a general guideline, students should be able to average one refereed publication per year that they are in the program. However, the dissertation committee shall decide the appropriate number and type of publications that the student is expected to complete, prior to the final dissertation defense. To enable the dissertation committee to make this decision, the student will present to the committee a list of “accepted/in-press”, “published”, “submitted”, and “to be submitted” publications at the time they defend their dissertation proposal. The decision of the committee needs to be unanimous in terms of the refereed publications requirement prior to the student defending their Ph.D. dissertation. The above decision of the dissertation committee can be changed at a later date (with unanimous approval of the dissertation committee) to fewer refereed publications than those originally committed at the dissertation proposal presentation.

Mechanical Engineering students who matriculate into the doctoral program with an M.S. degree must present their doctoral dissertation proposals no later than the end of the fourth semester following their entry into this program. In the event the proposal is not approved, the student will be given until the end of the fifth semester to gain the approval of a proposed dissertation topic.

Mechanical Engineering students who matriculate into the doctoral program with a B.S. degree, or whose admission status is changed from the M.S. program to the doctoral program, must present their doctoral dissertation proposals later than the end of the sixth semester following their entry into the doctoral program, or the M.S. program, whichever occurs first. In the event the proposal is not approved, the student will be given until the end of the seventh semester to gain the approval of a proposed dissertation topic.

Students who are unable to secure the approval of a proposed dissertation topic within the time limits set forth above will not be allowed to continue in the doctoral program. Such students will be permitted to remain in the program for one additional semester, after which their graduate admission will be terminated. Under no circumstances will such students be considered for readmission into the doctoral program.

## **Admission to Candidacy**

Once a student has passed his or her doctoral qualifying examination, completed the coursework in the doctoral program of study, and has obtained approval for his or her doctoral dissertation proposal, the student is considered to have completed the preliminary training and demonstrated his or her potential to successfully complete the Ph.D. degree. This is formally confirmed by the Office of the Registrar by recognizing the student as a Ph.D. Candidate. The student must submit the Application for Admission to Candidacy Form to the Office of the Registrar. This form must be approved by the Director of the Graduate Program and by the Office of the Registrar. Students must be admitted to candidacy at least 6 months prior to the date on which the degree will be conferred.

It is the responsibility of the student to submit an Application for Admission to Candidacy Form when all the requirements for candidacy have been fulfilled. The application form is available online at <http://gradschool.umd.edu/sites/gradschool.umd.edu/files/uploads/admission-to-candidacy-form.pdf>

This form may also be obtained from the ME Graduate Studies Office, 2168 Martin Hall. Applications must be received by the Office of the Registrar prior to the 25th of the month, in order for the advancement to be effective the first day of the following month.

Doctoral students who do not hold an M.S. degree in Mechanical Engineering, or Reliability Engineering may be awarded a non-thesis M.S. degree upon advancement to candidacy. Mechanical Engineering Students who wish to apply for this degree must have completed a minimum of 30 credits of graduate coursework. At least 24 credits must have been taken at the University of Maryland and at least 21 credits must have been derived from courses taken at the 600-level or above. Reliability Engineering Students who wish to apply for this degree must have completed a minimum of 30 credits of graduate coursework. At least 24 credits at the University of Maryland and at least 18 credits at the 600 level or above and completion of 6 credits of core courses. In such cases, the doctoral dissertation proposal fulfills the research

paper requirement of the non-thesis option and the doctoral proposal presentation serves as the department comprehensive examination. In addition, students must file the following forms:

1. Request for Inclusion or Transfer of Credits (if transferring credits not used for a previous graduate degree from another institution).
2. Approved Program Form, available online at <http://sph.umd.edu/sites/default/files/files/UMApproved%20Program.pdf>
3. Application for Graduation (Graduation Candidate Application), available online at <http://www.testudo.umd.edu/apps/candapp/>

## **PhD. Dissertation**

The doctoral dissertation must be prepared in consultation with the current edition of the University of Maryland Thesis Manual, which may be obtained at [https://gradschool.umd.edu/sites/gradschool.umd.edu/files/uploads/DissertationThesis/etd\\_style\\_guide\\_201708.pdf](https://gradschool.umd.edu/sites/gradschool.umd.edu/files/uploads/DissertationThesis/etd_style_guide_201708.pdf) A copy of the dissertation, after the student's advisor has approved it, must be provided to each member of the examining committee at least two weeks prior to the date of the examination.

Each doctoral candidate is required to defend his or her doctoral dissertation orally in English. The defense consists of a formal presentation of the dissertation followed by a closed session where the examining committee reviews the student's work. The dissertation defense cannot be held until the Graduate School approves the composition of the nominated dissertation examining committee.

In addition, a notice must be posted by the Department of Mechanical Engineering Graduate Office inviting faculty and students to the formal dissertation presentation. A copy of this invitation which must include the day, time, location, title, abstract, and committee membership should be sent by email to the Graduate Office ([megrad@umd.edu](mailto:megrad@umd.edu)), who will post it on the ME graduate student listserv and the website.

A few days before the examination is scheduled to take place, the Graduate Office will send the Report of the Examining Committee Form, Electronic Publication Form, and the Middle States Accreditation Form to the student's advisor, who will take these documents to the defense. Upon passing the examination, the forms are signed by each member of the examining committee and submitted to the ME Graduate Studies Office for forwarding to the Office of the Registrar. An electronic copy of the thesis must be submitted to the Graduate School (see below) and to the ME Graduate Studies Office. Students should also fill out the Department's Exit Information form found at: <http://megrad.umd.edu/graduate-student-exit-information-form/>

## Graduation Paperwork

The following forms must be completed and submitted prior to graduation:

- 1 Application for Graduation may be completed online at <https://www.testudo.umd.edu/>
- 2 Report of Examining Committee. This form must be filed with Office of the Registrar, 1113 Mitchell Bldg. after approval from the ME Graduate Studies Office, which is generated upon the approval of the Nomination of Thesis Committee Form.
- 3 An electronic copy of the thesis must be submitted online to the Graduate School <https://www.etsadmin.com/main/home?siteId=76>

The deadlines for the above forms are posted in the Schedule of Classes and online at <https://www.gradschool.umd.edu/calendar/deadlines>

Failure to submit the above listed forms by the established deadlines will result in postponement of the student's graduation to the following semester. In the semester prior to graduation, students should verify with the ME Graduate Studies Office, that they have met all the requirements for graduation.

### Summary of Requirements and Timeline for Mechanical Engineering

Admission to candidacy must be obtained within five years from entrance into the Ph.D. program. All remaining degree requirements must be completed within four years following admission to candidacy.

<b>1<sup>st</sup> Sem</b>	<ul style="list-style-type: none"> <li>▪ Ph.D. Plan of Study Approved by Advisor, Graduate Director</li> <li>▪ Ph.D. Qualifying Exam (preferred) if admitted with an M.S.</li> </ul>
<b>2<sup>nd</sup> Sem</b>	<ul style="list-style-type: none"> <li>▪ Ph.D. Qualifying Exam (mandatory if not taken previous semester)</li> </ul>
<b>3<sup>rd</sup>/<sup>4</sup> Sem</b>	<ul style="list-style-type: none"> <li>• Nomination of Dissertation Committee Form submitted at beginning of semester (prior to proposal presentation) (<a href="https://www.gradschool.umd.edu/sites/gradschool.umd.edu/files/uploads/nomination_of_thesis_or_dissertation_committee_form.pdf">https://www.gradschool.umd.edu/sites/gradschool.umd.edu/files/uploads/nomination_of_thesis_or_dissertation_committee_form.pdf</a>)</li> <li>• Present Ph.D. proposal and submit signed copy</li> </ul> <p>1 Application for Admission to Candidacy Form submitted after successful proposal presentation and completion of coursework on approved Ph.D. Coursework Plan Admission to Candidacy must be granted 6 months before dissertation defense</p>



	<p><a href="http://gradschool.umd.edu/sites/gradschool.umd.edu/files/uploads/admission-to-candidacy-form.pdf">http://gradschool.umd.edu/sites/gradschool.umd.edu/files/uploads/admission-to-candidacy-form.pdf</a>)</p> <ul style="list-style-type: none"> <li>• If student entered Ph.D. program with only B.S. then following Admission to Candidacy they may apply for an M.S. without Thesis.</li> </ul> <p>2 Certification of Master’s Degree Without Thesis Form submitted  <a href="https://www.gradschool.umd.edu/sites/gradschool.umd.edu/files/uploads/certification_of_masters_degree_without_thesis.pdf">https://www.gradschool.umd.edu/sites/gradschool.umd.edu/files/uploads/certification_of_masters_degree_without_thesis.pdf</a> )</p> <ul style="list-style-type: none"> <li>• Request for Inclusion or Transfer of Credits (if transferring any credits not used towards a previous graduate degree into the M.S. program—these credits must be approved on your Ph.D. Coursework Plan)  <a href="https://www.gradschool.umd.edu/sites/gradschool.umd.edu/files/uploads/request_for_transfer_or_inclusion_of_credit_for_masters_degrees.pdf">https://www.gradschool.umd.edu/sites/gradschool.umd.edu/files/uploads/request_for_transfer_or_inclusion_of_credit_for_masters_degrees.pdf</a>)</li> </ul> <p>3 Approved Program Form submitted  <a href="http://sph.umd.edu/sites/default/files/files/UMApproved%20Program.pdf">http://sph.umd.edu/sites/default/files/files/UMApproved%20Program.pdf</a>)</p> <ul style="list-style-type: none"> <li>• Application for Graduation for M.S. non-thesis submitted by first week of semester that M.S. without thesis degree will be awarded  <a href="http://www.testudo.umd.edu/apps/candapp/">http://www.testudo.umd.edu/apps/candapp/</a>)</li> </ul>
<b>Final Sem</b>	<ul style="list-style-type: none"> <li>• Registration for a minimum of one credit (including summer)</li> <li>• Application for Graduation (Ph.D.) submitted by first week of semester  <a href="http://www.testudo.umd.edu/apps/candapp/">http://www.testudo.umd.edu/apps/candapp/</a>)</li> <li>• Ph.D. Dissertation Defense (no less than 6 months after admission to candidacy)</li> <li>• Report of Examining Committee Form submitted following defense (sent by email to the advisor)</li> <li>• Electronic copy of dissertation submitted to the Graduate School at:  <a href="https://www.etdadmin.com/main/home?siteId=76">https://www.etdadmin.com/main/home?siteId=76</a></li> <li>• Electronic copy of dissertation submitted to ME Graduate Studies Office</li> <li>• Complete Department Exit Information Form</li> <li>• Upload and Submit the ISSS Exit plan through the following link (international students only)  <a href="https://globalmaryland.umd.edu/sites/default/files/ies/ExitPlanForm.pdf">https://globalmaryland.umd.edu/sites/default/files/ies/ExitPlanForm.pdf</a></li> </ul>

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|  | <ul style="list-style-type: none"><li>• Complete the Graduate School Surveys<br/><a href="https://gradschool.umd.edu/students/academic-progress/doctoral-student-surveys">https://gradschool.umd.edu/students/academic-progress/doctoral-student-surveys</a></li></ul> |
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## **Grade-Point Average**

Students seeking a graduate degree must maintain an average grade of “B” (3.0) in all courses that have been taken for graduate credit since enrollment in the degree program.

## **Time Limitation and Transfer of Credits**

With the exception of the six semester-hours of graduate-level course credits applicable for possible transfer to the master’s degree program, all requirements for the Master’s degree must be completed within a five-year period. When extraordinary conditions arise, this limitation can sometimes be extended to seven years by submitting a waiver request. This time limit applies to all coursework, including transfer credits from other institutions.

Admission to candidacy must be accomplished within five calendar years after admission into the doctoral program. All remaining requirements for the degree must be completed within four years of the admission to candidacy.

## **Program Advising**

Prior to registering for any courses, students should consult with their advisor. The ME Graduate Studies Office can advise and assist students in locating an advisor. It is the student’s responsibility to develop an approved coursework plan before the end of the first semester of study in consultation with their advisor. Courses that are not on an approved Plan of Study will not be counted toward the degree.

## **Minimum Registration Requirements**

Graduate students are required to register every fall and spring semester during the duration of their graduate studies. In addition, students must be registered for at least one credit during the semester they graduate (including summer term).

Upon achieving doctoral candidacy, the Department of Mechanical Engineering additionally requires that doctoral candidates be registered for a minimum of six credit hours of ENME 899 per semester until the twelve-credit minimum has been reached and until the student graduates.

## **Official Status**

Official status (either full-time or part-time) for academic purposes is determined on the basis of a student's registration at the end of the Schedule-Adjustment Period (the first ten days of classes). Students receiving a fellowship/scholarship must maintain full-time status throughout the semester in order to keep their scholarship/fellowship, unless otherwise stipulated by the donor in writing. International students on F1 and J1 student visas must also maintain full-time status throughout each semester according to Federal regulations governing F1 and J1 students. Students should contact an advisor in the International Students and Scholars Services Office if they have any questions concerning full-time status.

To be certified as a full-time, a graduate student must be officially registered for a combination of courses equivalent to 48 units per semester. Graduate assistants holding full-time teaching or research appointments are considered full-time students if they are registered for at least 24 units. Courses taken for Audit do not generate graduate units and cannot be used in calculating full-time or part-time status. The list below gives the number of units per credit hour for each course level.

<b>Course Number</b>	<b>Graduate Units</b>
000-399	2 units per credit hour
400-499	4 units per credit hour
500-599	5 units per credit hour
600-798	6 units per credit hour
800-897	6 units per credit hour
799	12 units per credit hour
898	18 units per credit hour
899	18 units per credit hour
UMEI 005	6 units per credit hour
UMEI 006	2 units per credit hour
UMEI 007	4 units per credit hour
UMEI 008	2 units per credit hour