

**Mechanical Engineering  
Ph.D. AND MS DEGREE REQUIREMENTS**

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## **1. Introduction**

### **1.1 Aims and Scope:**

Mechanical Engineering is a multidisciplinary field that includes the traditional areas of solid and fluid mechanics and the transport phenomena associated with processes related to design, fabrication, and analysis of mechanical devices and systems. Today, Mechanical Engineers develop applications in biomedical, space, energy, materials, computational sciences, and many other fields. The Mechanical Engineering (ME) Graduate Group at UC Merced offers a multidisciplinary research and training program for M.S. and Ph.D.-seeking students who want to be at the forefront of new methods of solving mechanical problems at various length and time scales. Research projects are available on topics ranging from fundamental mathematical methods to advanced applications, and coursework will provide a background in the latest techniques in analytical, computational, and experimental methods in Mechanical Engineering.

The graduate emphasis in Mechanical Engineering is dedicated to the education of a new generation of engineers and researchers of areas related to mechanical engineering who aim to master the fundamentals of the mechanical sciences -- which include disciplines such as continuum mechanics, fluid mechanics, heat and mass transfer, energy conversion, etc. -- while being exposed to the forefront of research techniques, methodologies and equipment to solve problems that are relevant to modern society (green energy, mechanical modeling and synthesis, robotics and mechatronics, control systems, etc.).

### **1.2 Admissions Requirements:**

Applicants must meet the minimum requirements for admission to graduate study at University of California, Merced, described in the Section II of the [Graduate Student Handbook](#). Admission into Mechanical Engineering further requires a bachelor's degree, three letters of recommendation, official transcripts, TOEFL or IELTS score (if applicable) and submission of the graduate online application with fee by the stated admission deadline. A minimum GPA of 3.0 on a 4.0 scale is required. Admission decisions are made on a case-by case basis. Meeting some or all these criteria does not guarantee admission, but merely eligibility.

Academically qualified students may also be required to complete a remote or in-person interview with one or more of the ME faculty members. Finally, the match of the candidate's skills and interests to ME research programs will be considered. For this reason, applicants are encouraged to contact participating faculty before applying. As a guideline, a prospective graduate student in ME should have adequate background in mechanical sciences, which typically involve higher division classes in Fluid Mechanics, Solid Mechanics (Rational Mechanics, Classical Mechanics, Dynamics or equivalent), and adequate Mathematics background (Linear Algebra, Differential Equations, Numerical Methods, etc.).

The decision to recommend admission to the Vice Provost and Dean of Graduate Education will be made by the Graduate Group Admissions Committee based on available space and the competitiveness of applicants compared to the eligible pool.

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Admission decisions are made on a case-by case basis. Meeting some or all these criteria does not guarantee admission, but merely eligibility.

**1.2.1 Prerequisites:** There are no general prerequisites for admission. There is no specified list of these courses, and the requirements for a given student are handled on a case-by-case basis.

**1.2.2 Deficiencies:** Coursework deficiencies, as identified by each student's advisor after their admission into the program, should be made up by the end of the first academic year following initial enrollment by earning a letter grade of "B" or better.

### **1.3 Committees**

**1.3.1 Admissions Committee:** The Admissions committee is charged with the development of recruiting materials for the Group, reviewing applications for admissions, making recommendations for admissions to the Dean of Graduate Studies, exploring graduate student support mechanisms, and allocating intramural financial assistance. The Committee consists of the Graduate Group Chair, Department Chair, and the Admissions Chair, who is appointed by the Graduate Group Chair in consultation with the Department Chair.

**1.3.2 Executive Committee:** The Executive Committee, in consultation with the faculty, determines and implements policy for the good of the Group, establishes and guides the educational requirements of the Group, and represents the interests of the Group to University and other agencies. The Committee consists of the Graduate Group Chair, Department Chair, Department Vice Chair, and the Undergraduate Chair.

## **2. Master's Degree Requirements**

Students may be admitted to the ME graduate program to work toward an M.S. degree. The recipient of an M.S. degree will possess knowledge of a broad field of learning that extends well beyond that attained at the undergraduate level but is not necessarily expected to have made a significant original contribution to knowledge in that field.

The ME group has established the following requirements for the M.S. degree. Each M.S. student must have a faculty advisor responsible for designing and approving a plan of study detailing all classes to be taken. Two different tracks are recognized as described below. Students may switch from one M.S. plan to another with their faculty advisor's consent.

**2.1 Degree Plan I - Thesis:** This plan requires a minimum of 30 semester units of approved courses, at least 20 of which must be earned in 200-series graduate-level courses, exclusive of credit given for thesis research and preparation. In addition, 9 units of research and 1 unit of ME seminar is required for MS Plan 1. A written thesis and oral defense are also required.

**2.1.1 Program Learning Outcomes (PLOs):** Graduates with an M.S. in Mechanical Engineering (thesis option) are:

- i. Able to conduct supervised research in mechanical engineering and can contextualize this research in the current literature of the field.
- ii. Able to apply their knowledge of mathematics, science, and engineering to design and implement a solution, under appropriate guidance, to solve a problem.
- iii. Able to conduct experiments and/or simulations of mechanical systems, and to analyze and evaluate these solutions in the context of existing technologies.
- iv. Have lifelong learning skills and, under guidance, able to acquire or create new engineering techniques, skills, and tools for research and development in mechanical engineering.
- v. Exhibit high professional standards in research, demonstrating objectivity, ethical conduct, and integrity.
- vi. Able to communicate effectively through oral, visual, and written means, with a broad range of technical audiences.

**2.1.2 Course Requirements - Core and Electives (minimum 30 units)**

**2.1.2.1 Core Courses (minimum 30 units)**

<b>Course Number</b>	<b>Course Name</b>	<b>Minimum Units</b>
ME 200-290 (or graduate level courses in other majors as appropriate)	Mechanical Engineering (or other majors as appropriate) Graduate Courses, letter-graded.	20
ME 291	Mechanical Engineering Seminar Series	1
ME 295	Graduate Research	9

**2.1.2.2 Elective Courses (total 0 units)**

There are no Elective course requirements.

**2.1.2.3 Summary:** 20 units of core coursework, 9 units of research, and 1 unit of ME Seminar are required for a total of 30 units. No courses are uniformly required for all ME graduate students. Students should work with their advisors to determine which courses are best suited for their research areas. Course selection should be discussed with advisors each year at the annual review meeting. This may include any letter-graded graduate level ME course (200 or higher) as well as graduate level courses in other areas with the consent of the advisor. Full-time students must enroll for 12 units per semester including research, academic and seminar units. Courses that fulfill any of the graduate group course requirements may not be taken

S/U (with the exception of ME 291 and ME 295). Requirements for formal course work beyond the minimum are flexible and are determined by the individual student's background and research topic in consultation with the student's graduate research advisor.

**2.1.3 Special Requirements:** "N/A"

**2.1.4 Advancement to Candidacy:** Before advancing to candidacy for the Master's degree, a student must have satisfied all plan requirements set by the graduate program and must have maintained a minimum cumulative GPA of 3.0 in all course work undertaken. Normally, students advance by the end of the semester prior to the final semester. The student must file the appropriate paperwork (Application for Advancement to Candidacy for the Master's Degree and Conflict of Interest Form) by the deadline set in the Graduate Division website.

**2.1.5 Thesis Requirements:** The student will prepare a written thesis under supervision of their faculty advisor until the work is ready for review by the faculty committee. The student must provide a copy of the thesis to each member of the faculty committee and allow each committee member at least 1 week to read and comment on it. If one or more committee members believe that there are significant errors or shortcomings in the thesis or that the scope or nature of the work is not adequate, the student must address these shortcomings before scheduling a defense. Once the committee members are in agreement that the thesis is ready to be defended, the defense may be scheduled by the student in consultation with the committee. Once the date of the thesis defense is determined, this information must be reported to the Graduate Dean.

The thesis defense consists of an in-person open seminar followed by a closed-door examination by the thesis committee. During the examination, the student is expected to explain the significance of the research, justify the methods employed, and defend the conclusions reached.

At the conclusion of the examination, the committee shall vote on whether the thesis and the student's performance on the exam are of satisfactory quality to earn a University of California M.S. degree. A unanimous vote of the committee is required for a pass. Members of the committee may vote to make passing the exam contingent on corrections and/or revisions to the thesis. In this case, the committee will select one member, normally the graduate research advisor, who will be responsible for approving the final version of the thesis that is submitted to the Graduate Division. All members of the thesis committee must sign the final thesis.

Should the Thesis Committee determine that the thesis is unacceptable, a recommendation to disqualify the student may be made to the Vice Provost and Dean of Graduate Education.

Detailed information and instructions on the submission and filing of the thesis is available in the UCM Thesis and Dissertation Manual. A schedule of dates for filing

the thesis in final form are published on the Graduate Division website in the [Dates and Deadlines section](#).

**2.2 Degree Plan II - Non-thesis:** This plan requires a minimum of 30 units in approved courses, at least 24 of which must be from graduate-level, letter-graded courses in the 200 series, exclusive of credit given for thesis research and preparation. In addition, 1 unit of ME seminar is required for MS Plan II. The remaining 5 units can come from graduate-level, letter-graded courses and/or courses graded with S/U as well as research units (ME 295). A comprehensive examination is also required for each candidate. No thesis is required.

**2.2.1 Program Learning Outcomes (PLOs):** Graduates with an M.S. in Mechanical Engineering (non-thesis option) are:

- i. Able to apply their knowledge of mathematics, science, and engineering to design and implement a solution, under appropriate guidance, to solve a problem.
- ii. Able to conduct experiments and/or simulations of mechanical systems, and to analyze and evaluate these solutions in the context of existing technologies.
- iii. Have lifelong learning skills and, under guidance, able to acquire or create new engineering techniques, skills, and tools for research and development in mechanical engineering
- iv. Exhibit high professional standards, demonstrating objectivity, ethical conduct, and integrity.
- v. Able to communicate effectively through oral, visual, and written means, with a broad range of technical audiences.

**2.2.2 Course Requirements - Core and Electives (total 30 units)**

**2.2.2.1 Core Courses (total 30 units)**

<b>Course Number</b>	<b>Course Name</b>	<b>Units</b>
ME 200-290 (or graduate level courses in other majors as appropriate)	Mechanical Engineering (or other majors as appropriate) Graduate Courses, letter-graded.	24
ME 200-290 (or graduate level courses in other majors as appropriate) and/or ME 295 (Graduate Research)	These 5 units can come from graduate level, letter-graded courses and/or courses graded with S/U as well as research units (ME 295).	5
ME 291	Mechanical Engineering Seminar	1

	Series	
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**2.2.2.2 Elective Courses (total 0 units)**

There are no Elective course requirements.

**2.2.2.3 Summary:** 29 units of core coursework and 1 unit of ME Seminar are required for a total of 30 units. Note that no research effort is required. No courses are uniformly required for all ME graduate students. Students should work with their advisors to determine which courses are best suited for their research areas. Course selection should be discussed with advisors each year at the annual review meeting. This may include any letter-graded graduate level ME course (200 or higher) as well as graduate level courses in other areas with the consent of the advisor. However, at least 18 of the 24 units must be completed in Mechanical Engineering Graduate Courses. Full-time students must enroll for 12 units per semester including research, academic and seminar units. Requirements for formal course work beyond the minimum are flexible and are determined by the individual student's background and research topic in consultation with the student's graduate research advisor.

**2.2.3 Special Requirements: "N/A"**

**2.2.4 Advancement to Candidacy:** Before advancing to candidacy for the Master's degree, a student must have satisfied all plan requirements set by the graduate program and must have maintained a minimum cumulative GPA of 3.0 in all course work undertaken. The student must file the appropriate paperwork (Application for Advancement to Candidacy for the Master's Degree) by the deadline specified on the Graduate Division Website.

**2.2.5 Comprehensive Examination:** Fulfillment of the Comprehensive Examination is the last requirement of the M.S. Plan II. A student may take the comprehensive examination once they have advanced to candidacy. However, it is important that the comprehensive exam be completed at or near the end of the coursework for the Master's degree; for most students, the exam is taken at the end of the fourth semester. The exam is administered by the Comprehensive Examination Committee that consists of faculty members teaching the courses that the student chooses for his exam.

**2.2.5.1 Timing:** Students may take the comprehensive examination once they have advanced to candidacy. However, it is important that the comprehensive exam be completed at or near the end of the coursework for the Master's degree. For most students, the exam is taken at the end of last semester. Students must be registered or in current filing fee status at the time when they take the examination.

**2.2.5.2 Examination:** The M.S. comprehensive examination is an examination of graduate level Mechanical Engineering curriculum. The content of the

exam will be specific to the courses taken by each student. Each student will choose three 200-level ME courses among those taken, and the relevant instructors will evaluate the student's understanding on the subject. The evaluation will be performed within 2 weeks after the student's last semester that completes the coursework for the degree. The exam will comprise of problems from tests or assignments given to the student while taking ME graduate courses towards the unit requirement. The evaluation method will be determined by each instructor. The grades the student received can be used to determine result of the comprehensive examination automatically. The ME Graduate Group Chair will compile all available grades to determine the outcome.

**2.2.5.3 Outcome:** Examinations can result in either a pass, fail, or partial pass by unanimous consensus of the Comprehensive Examination Committee; please refer to 2.2.5 for the committee's composition. The results, as well as the procedures for repeating a failed examination, are described in Section VI. F of the Graduate P&P Handbook. The Graduate Group Chair must report the result to the Graduate Council via the Vice Provost and Dean of Graduate Education within 30 days, using the Final Report for the Master's Degree Form found on the Graduate Division website.

The categories are described below.

- a. Pass- A student has passed when the Comprehensive Examination Committee unanimously votes that the student passed the entire examination with scholarship that is at least acceptable. The committee must report to the Graduate Council via the Vice Provost and Dean of Graduate Education within 30 days. If agreed unanimously by the committee the student may be allowed to make minor modifications prior to submitting the results of the examination.
- b. Fail- A student has failed when the Comprehensive Examination Committee votes unanimously that the student failed the entire examination. The second examination may have a format different from the first, but the substance should remain the same. A student whose performance on the second attempt is also unsatisfactory, or who does not undertake a second examination within a reasonable period of time, is subject to academic disqualification. A third examination may be given only with the approval of the Graduate Group committee and the Vice Provost and Dean of Graduate Education.
- c. Partial Pass- A student has partially passed when the Comprehensive Examination Committee votes unanimously that the student passed some components but failed others. In this instance, the following apply:

- i. The student has the option of taking a second examination as detailed above on the components failed; and
- ii. The chair of the committee must write a letter to the student, with a copy to the Graduate Division, conveying the information about the student's performance (pass, fail, or partial pass) on each of the components covered during the examination.

Once passed, the Final Report for the Master's Degree Form is signed by the Program Graduate Advisor and then forwarded to the Graduate Division. The deadlines for completing this requirement are listed each semester in the Graduate Division website. The committee must report the results to the Graduate Council via the Vice Provost and Dean of Graduate Education within 30 days.

### **2.3. Advising Structure and Mentoring**

**2.3.1 Advising Structure:** A graduate student is expected to have a faculty advisor at all times during their graduate studies. Students are assigned an advisor when they are admitted to the program, based on mutual research interest and prior communication between the student and the advisor.

The graduate advisor is the faculty member who supervises the student's coursework, research and/or thesis. The Graduate Advisor, who is appointed by Graduate Group Chair, is a resource for information on academic requirements, policies and procedures, and registration information until the Thesis Committee is formed. The Graduate Group Staff assists students with identifying appointments and general university policies. The ME Graduate Group has adopted the GC approved Mentoring Guidelines that can be found here: [UCM Mentoring Guidelines](#).

In the absence of a faculty advisor, the Graduate Group Chair becomes the student's temporary advisor. It is the responsibility of the student to secure a permanent advisor within a semester.

### **2.4. Master's Degree Committees:**

**2.4.1 Thesis Committee:** The MS Plan-I student, in consultation with his/her graduate advisor and graduate group chair, nominate 3 faculty who are voting members of the University of California Academic Senate to serve on the Thesis Committee (one of the three can be the graduate advisor). These nominations are submitted, as recommendations from the Graduate Group Chair, to the Vice Provost and Dean of Graduate Education for formal appointment in accordance with Graduate Council policy. The Chair of the committee shall always be a member of the Merced Division and of the Graduate Group supervising the master's program; no exceptions will be granted for this position. Detailed instructions are found in Graduate Policies and Procedures, Section VII. A.2.2, at the [Graduate Division](#)

[Website](#). Please note that the Chair of the committee can be the graduate advisor or another senate voting member of the committee.

Under some circumstances one of the committee members can be a UC Merced faculty member from outside the group or a regular or adjunct faculty member from any UC campus or an individual from outside the University of California who has special expertise and qualifications. In this case, the graduate research advisor should submit a brief statement indicating the appointee's affiliation and title and how the prospective appointee has special expertise or qualifications that are not represented on the campus. In addition to the justification letter from the graduate advisor, a curriculum vita and a letter from the proposed appointee indicating a willingness to serve must be submitted to the Chair of the ME graduate group for review. External committee members must also be approved by the Graduate Dean. No outside member participation is required for either the M.S. thesis committee.

All members of the committee and the student must be in attendance in person for the M.S. thesis defense. In rare instances, such as with a faculty committee member being not in residence, the in-person attendance requirement can be waived. These requests must be submitted to the Graduate Division and approved by the Graduate Dean. The in-person attendance requirement can be waived (in favor of remote attendance) only in specific cases that involve sickness or long travel distances. These requests must be submitted to the Graduate Division via a petition. If a committee member's absence from campus for an extended period of time makes scheduling of examinations unreasonably difficult, the student may request that the committee be reconstituted. Reconstitution of the committee may also be justified by a substantial change in the student's thesis topic or may be required by the departure of a committee member from the university. When membership changes must be made, the graduate advisor in consultation with the student should recommend a new committee member, giving the reason for the change. The change must be reviewed and approved by the Chair of the ME graduate group.

**2.4.2 Comprehensive Examination Committee:** The comprehensive examination committee for MS Plan-II is comprised of three senate voting ME faculty members, who are the instructors of the courses the student took during the degree program and chose for their Comprehensive Examination.

**2.5 Normative Time to Degree:** For students who are engaged in full-time study and making adequate progress, it is expected that they would advance to candidacy and complete the degree in two years. Extensions beyond these limits can be permitted by the Chair of the ME Graduate Program.

**2.6 Typical Timeline and Sequence of Events:** The goals and needs of individual students vary considerably, and no single plan will accommodate all students. Therefore, the following program of study should be considered as a general guide only. In particular, the following example illustrates a 2-year program of study, which may not be appropriate for all students.

## **[Mechanical Engineering]- Policies and Procedures**

A sample curriculum for M.S. Plan I is as follows

<b>Year</b>	<b>Fall Semester</b>	<b>Spring Semester</b>
<b>1</b>	ME 202: Transport Phenomena (3) ME 231: Conduction Heat Transfer (3) ME 229: Tribology (3) ME 295: Graduate Research (2) ME 291: ME Seminar Series (1)	ME 220: Continuum Mechanics (3) ME 232: Convective Heat and Mass Transfer (3) ME 295: Graduate Research (6)
<b>2</b>	ME 236: Advanced Mass Transfer (4) ME 295: Graduate Research (8)	ME 295: Graduate Research (12 units) Complete and defend M.S. thesis

A sample curriculum for M.S. Plan II is as follows

<b>Year</b>	<b>Fall Semester</b>	<b>Spring Semester</b>
<b>1</b>	ME 202: Transport Phenomena (3) ME 201: Advanced Dynamics (3) ME 291: ME Seminar Series (1) ME 299: Directed Independent Study (5)	ME 220: Continuum Mechanics (3) ME 211: Nonlinear Controls (3) ME 232: Convective Heat and Mass Transfer (3) ME 299: Directed Independent Study (3)
<b>2</b>	ME 210: Linear Controls (3) ME 280: Fractional Order Mechanics (4) ME 236: Advanced Mass Transfer (4) ME 299: Directed Independent Study (1)	ME 229: Tribology (3) ME 299: Directed Independent Study (9) M.S. Comprehensive exam

**Note:** Students in M.S. Plan II may choose to enroll in ME 295 Graduate Research even though it is not required. The credits for ME 295: Graduate Research and directed independent study (ME 299) provide an opportunity for the student to broaden their knowledge and skills by working with faculty. They can also be used for fulfilling the full-time requirement and preparing for the comprehensive examination.

**2.7 Sources of Funding:** Graduate students who received a funding offer with their admissions offer will have their financial support according to the terms of the funding offer. Funding will come through a combination of Teaching Assistantships, Graduate Research Assistantships, and/or Fellowships. Master's students are typically not expected to be funded by such means; but they may receive a funding offer with their admissions offer. More information on financial support can be found in the [Graduate Policies and Procedures Handbook](#).

### **3. Doctoral Degree Requirements**

The Doctor of Philosophy degree is granted to students who demonstrate a thorough knowledge of a broad field of learning and have given evidence of distinguished accomplishment in that field. The degree also signifies that the recipient has critical ability and powers of imaginative synthesis as demonstrated by a doctoral dissertation containing an original contribution to knowledge in his or her chosen field of study.

#### **3.1 Program Learning Outcomes (PLOs):** Graduates with a Ph.D. in Mechanical Engineering are:

- i. Able to identify significant research questions in mechanical engineering and contextualize their research in the current literature of the field.
- ii. Able to apply their knowledge of mathematics, science, and engineering to solve a problem, and to design and implement a suitable solution.
- iii. Able to design and conduct experiments and/or simulations of mechanical systems, and to analyze and evaluate solutions in the context of existing technologies.
- iv. Have lifelong learning skills and are able to acquire and use new engineering techniques, skills, and tools for research and development in mechanical engineering, and to develop new methods and discover new knowledge.
- v. Exhibit high professional standards in research, demonstrating objectivity, ethical conduct, and integrity.
- vi. Able to communicate effectively through oral, visual, and written means, with a broad range of technical audiences.

#### **3.2 Course Requirements - Core and Electives (30 units minimum ):**

<b>Course Number</b>	<b>Course Name</b>	<b>Units</b>
ME 200-290 (or graduate level courses in other majors as appropriate)	Mechanical Engineering (or other majors as appropriate) Graduate Courses. Up to one upper-division, undergraduate level course is allowed.	28
ME 291	Mechanical Engineering Seminar Series	2

Students entering the Ph.D. program with a Bachelor's degree only and intend to obtain a "along-the-way MS degree" must pass both "preliminary exam" and "qualifying exam (proposal defense)" and satisfy MS-Plan I or MS-Plan-II requirements (with no additional Comprehensive Examination). The total course credit requirements in this case would be a total of 43 units (2 of which are units of Mechanical Engineering Seminar Series, and 9 of which can come from Graduate Research units in the case of a Plan I MS degree).

Please note that courses taken toward a graduate degree at another institution cannot be transferred for credit toward a Ph.D. at UCM. However, students entering with graduate-level course credit obtained from another university or program (e.g., having obtained a M.S. degree) may petition the ME Graduate Group to waive course requirements. The Committee will consider the rigor of the courses completed, the grades obtained, and evidence that the student has a foundational knowledge of Mechanical Engineering. Normally, up to 16 units can be waived with the approval of the ME Graduate Group (for graduate courses taken at other institutions or other programs).

No courses are uniformly required for all ME graduate students. Students should work with their advisors to determine which courses are best suited for their research areas. Course selection should be discussed with advisors each year at the annual review meeting. This may include any letter - graded graduate level ME course (200 or higher) as well as graduate level courses in other areas with the consent of the advisor. Full-time students must enroll for 12 units per semester including research, academic and seminar units. Courses that fulfill any of the graduate group course requirements may not be taken S/U (with the exception of ME 291 and ME 295). Please note that up to one upper-division, undergraduate level course can be counted toward the graduate-level course requirement. Requirements for formal course work beyond the minimum are flexible and are determined by the individual student's background and research topic in consultation with the student's graduate research advisor. Exceptions of these requirements due to transference from another graduate program will be analyzed on an individual basis.

### **3.3 Special Requirements:**

**3.3.1 Teaching Requirement:** All students pursuing a Ph.D. degree in ME are required to complete at least one semester as Teaching Assistant (TA). This requirement can be waived in exceptional circumstances where the student has had demonstrated teaching experience through other means, with approval of the Chair of the Graduate Group and Executive Committee.

**3.3.2 Language Requirement:** N.A.

**3.3.3 Preliminary Examination:** All students in the ME Ph.D. program are required to pass a written preliminary examination before beginning to prepare for the research proposal and qualifying examination. Please refer to 3.6.a for the structure of the Exam Committee and the general content, and 3.8. for information about the timing of the exam.

**3.3.4 Technical Seminar:** All students in pursuing a Ph.D. degree in ME are required to give at least one open technical seminar or professional conference presentation during their residence. The topic of the seminar may be the student's own research, or it may be any other topic that falls within the areas of study spanned by the group, broadly defined. The open public presentation given as part of the Ph.D. defense may be counted as the required seminar.

**3.4. Advising Structure and Mentoring:** The graduate advisor is the faculty member who supervises the student's research and dissertation. Students are assigned an advisor when they are admitted to the program, based on mutual research interest and prior communication between the student and the advisor. The Graduate Advisor, who is appointed by Graduate Group Chair, is a resource for information on academic requirements, policies and procedures, and registration information until the Thesis Committee is formed. The Graduate Group Staff assists students with identifying appointments and general university policies. The ME Graduate Group has adopted the GC approved Mentoring Guidelines that can be found here: [UCM Mentoring Guidelines](#).

**3.5 Doctoral Degree Committees:**

- a) **Preliminary Examination Committee:** The Preliminary Examination Committee is charged with administering the examination. A minimum of two questions in three (out of six, please see 3.8) ME examination topics (chosen by the student) will be posed and graded by a committee of ME faculty members familiar with the field. The Preliminary Exam Chair, appointed by the Graduate Chair, appoints the members of the Preliminary Examination Committee. The examination will be followed by a ME group faculty meeting to evaluate the performance of the candidate. Based on the results of each of the three exams which comprise the Preliminary Examination, a committee of ME faculty members will discuss a student's overall exam performance and make a determination of the possible outcomes.
  
- b) **Candidacy Committee (Research Proposal and Qualifying Examination Committee):** The Candidacy Committee is charged with determining the fitness of the student to proceed with the doctoral dissertation through a formal Qualifying Examination. The student, in consultation with graduate advisor, nominates four ME faculty to serve on the Candidacy Committee (one of the four will be the student's research advisor). These nominations are submitted to the Graduate Group Chair for formal appointment in accordance with Graduate Council policy. Under some circumstances, e.g., an expert in the research topic from outside ME, one of the committee members can be a UC Merced faculty member from outside the ME group or a regular or adjunct faculty member from any UC campus or an individual from outside the University of California who has special expertise and qualifications. In this case, the graduate research advisor should submit a brief statement indicating the appointee's affiliation and title and how the prospective appointee has special expertise or qualifications that are not represented on the campus. In addition to the justification letter from the graduate advisor, a curriculum vita and a letter from the proposed appointee indicating a willingness to serve must be submitted to the Chair of the ME graduate group for review. External committee members must also be approved by the Graduate Dean. Please note that the Chair of the committee can be the graduate advisor or another member of the committee. No outside member participation is required for the qualifying exam committee. The Application for

Qualifying Examination available on the Graduate Division website must be submitted one month prior to the proposed examination date. Students must be in good academic standing and registered for the semester in which the examination is held. The Candidacy Committee reviews the student's written research proposal, research outline, and progress summary and timeline, no later than 1 week before the scheduled Qualifying Examination. The Candidacy Committee conducts the exam and submits results to the Graduate Division using the Qualifying Examination Report Form.

- c) **Doctoral (Dissertation) Committee:** Ph.D. dissertation committees in the ME group typically consist of four members, although additional committee members are permitted if warranted by the student's research project. One is the student's graduate research advisor, and the three or more others are UC Merced faculty members in the ME group. Please note that the Chair of the committee can be the graduate advisor or another member of the committee. Under some circumstances, e.g., an expert in the research topic from outside ME, one of the committee members can be a UC Merced faculty member from outside the ME group or a regular or adjunct faculty member from any UC campus or an individual from outside the University of California who has special expertise and qualifications. In this case, the graduate research advisor should submit a brief statement indicating the appointee's affiliation and title and how the prospective appointee has special expertise or qualifications that are not represented on the campus. In addition to the justification letter from the graduate advisor, a curriculum vita and a letter from the proposed appointee indicating a willingness to serve must be submitted to the Chair of the ME graduate group for review. External committee members must also be approved by the Graduate Dean. No outside member participation is required for either the M.S. thesis or Ph.D. dissertation committees.

All members of the committee and the student must be in attendance in person for the Ph.D. dissertation defense. In rare instances, such as with a faculty committee member being not in residence, the in-person attendance requirement can be waived. These requests must be submitted to the Graduate Division and approved by the Graduate Dean." The in-person attendance requirement can be waived (in favor of remote attendance) only in specific cases that involve sickness or long travel distances. These requests must be submitted to the Graduate Division via a petition. If a committee member's absence from campus for an extended period of time makes scheduling of examinations unreasonably difficult, the student may request that the committee be reconstituted. Reconstitution of the committee may also be justified by a substantial change in the student's thesis topic or may be required by the departure of a committee member from the university. When membership changes must be made, the graduate advisor in consultation with the student should recommend a new committee member, giving the reason for the change. The change must be reviewed and approved by the Chair of the ME graduate group.

**3.6 Advancement to Candidacy:** Before advancing to candidacy for a doctoral degree, a student must have satisfied all requirements set by the graduate program, must have maintained a minimum GPA of 3.0 in all course work undertaken, and must have passed the Preliminary Examination and unanimously passed the Qualifying Examination by the Candidacy Committee appointed to administer that examination. Normally, students advance by the end of the 6th semester. The student must file the appropriate paperwork (Advance to Candidacy for the Degree of Doctor Philosophy Form and Conflict of Interest Form) with the Graduate Division by the date specified in the Graduate Division website and pay the candidacy fee in order to be officially promoted to Ph.D. Candidacy.

**3.7 Preliminary Examination Requirements:** All students in the ME Ph.D. program are required to pass a preliminary examination before submitting the Research Proposal and taking the Qualifying Examination. Students are encouraged to take the examination at the end of their first year of study but are required to take it within the first two years of graduate study unless they successfully petition the graduate group chair. The preliminary examination will be offered and administered by the ME Graduate Group twice per year, once in the spring semester and once in the fall semester. A student wanting to take the exam must sign up for it with the ME Graduate Group in response to communication from the Chair of the Preliminary Examination Committee.

**i) Conduct of the Exam**

The preliminary examination will cover undergraduate core material from three out of six ME focus areas:

1. Thermodynamics
2. Fluid Mechanics
3. Heat Transfer
4. Dynamics
5. Controls
6. Solid Mechanics

The candidate may choose any three of the focus areas in the preliminary examination. The examination will consist of open-ended questions (with a minimum of two questions in each of the three chosen focus areas) to be posed and graded by a committee of ME faculty members familiar with the field (Preliminary Examination Committee). The format will be a single day 6-hour examination. The examination will be followed by an ME group faculty meeting to evaluate the performance of the candidate.

**ii) Outcome of the Exam**

Based on the results of each of the three exams, a committee of ME faculty members will discuss a student's overall exam performance and make a determination of one of the possible outcomes:

- Pass- A student has passed when the Preliminary Examination Committee unanimously votes that the student passed the entire examination with scholarship that is at least acceptable.
- Partial Pass - A student has failed but with the option to retake the exam when the Preliminary Examination Committee votes unanimously that the student passed some focus area examinations but failed others. In this instance, the student has the option of taking a second examination, consisting only of the focus areas that were not passed the first time, the next time the preliminary exams are offered. The second examination may have questions different from the first, but the substance should remain the same.
- Fail - A student has failed when the Preliminary Examination Committee votes unanimously that the student failed the entire examination. This can occur if the overall performance on the exam is such that the committee does not judge that a retake would reflect better performance. An outcome of Fail also applies for a student whose performance on a second attempt of an exam is unsatisfactory, or who does not undertake a second examination within one year of the initial attempts. In either case, this outcome is grounds for requesting that the Graduate Dean initiate the academic disqualification process. It should be noted that the student can still obtain a Master's degree, if they fulfill the related requirements.

Once a unanimous decision has been reached, the ME Graduate Group chair shall inform the student of its decision in one of the forms listed above.

**3.8 Qualifying Examination Requirements:** After a student has completed all coursework and passed the ME Preliminary Examination, they are ready to prepare for the research proposal and qualifying examination. Before the qualifying examination, the student will provide to the degree committee a research proposal that describes his or her research topic, summarizes progress to date, and outlines what he or she proposes to do, why it is relevant, and what will be learned. The dissertation committee will receive this document no later than 1 week before the scheduled qualifying examination, which will include two parts: presentation of the proposal related to thesis research, and a structured oral examination. The student must be registered the semester of the exam.

i. Conduct of the Exam:

Although the formal Qualifying Examination for candidacy ordinarily is conducted in a single day, the Committee may meet intermittently over a longer period, and may decide to reexamine the student on one or more topics after a specified interval. When the Committee meets to conduct the oral Qualifying Examination, it must report to the Graduate Council via the Vice Provost and Dean of Graduate Education within 30 days. Upon completion of the qualifying examination and all other Graduate Group requirements for Advancement to Candidacy, the results should be

submitted to the Graduate Division on the Qualifying Examination Report Form. The Qualifying Examination Report Form must be signed by all committee members at the time the candidacy examination is concluded and submitted even if the student failed the examination. Prior to convening a student committee for advancement to candidacy exam, the Faculty Advisor, the Graduate Group Chair, and the graduate student must sign the Statement on Conflict of Interest form that is included in the Advancement to Candidacy for the Degree of Doctor of Philosophy form. If the unanimous recommendation of the Committee is favorable, the student must pay the current advancement to candidacy fee to the campus Cashier's Office that will validate the advancement to candidacy form. The student must then submit the advancement to candidacy form to the Graduate Division. The candidate and graduate program will be notified of formal advancement and the appointment of a Doctoral Committee. Advancement to Candidacy begins with the first academic term following completion of all requirements (including submission of all forms).

ii. Outcome of the Exam:

Before voting upon its recommendation for or against candidacy, the Committee, as a whole, shall meet with the student, and any member of the Committee will have the right to pose appropriate questions to the student. The Committee must conclude its examination when convened with the student present. The committee, having reached a unanimous decision, shall inform the student of its decision to:

- Pass- A student has passed when the Qualifying Examination Committee unanimously votes that the student passed the entire examination with scholarship that is at least acceptable. The committee must report to the Graduate Council via the Vice Provost and Dean of Graduate Education within 30 days. If agreed unanimously by the committee the student may be allowed to make minor modifications prior to submitting the results of the examination.
- Fail- A student has failed when the Qualifying Examination Committee votes unanimously that the student failed the entire examination. The second examination may have a format different from the first, but the substance should remain the same. A student whose performance on the second attempt is also unsatisfactory, or who does not undertake a second examination within a reasonable period of time, is subject to academic disqualification. A third examination may be given only with the approval of the Graduate Group committee and the Vice Provost and Dean

of Graduate Education.

- Partial Pass- A student has partially passed when the Qualifying Examination Committee votes unanimously that the student passed some components but failed others. In this instance, the following apply:
  - The student has the option of taking a second examination as detailed in above on the components failed; and
  - The chair of the committee must write a letter to the student, with a copy to the Graduate Division, conveying the information about the student's performance (pass, fail, or partial pass) on each of the components covered during the examination.

If a unanimous decision takes the form of "Partial Pass" or "Fail", the Chair of the Candidacy Committee must include in its report a specific statement, agreed to by all members of the committee, explaining its decision and must inform the student of its decision.

**3.9 Dissertation Requirements:** The Ph.D. dissertation must be an original, creative and independent work that can stand the test of peer review. The expectation is that the material will serve as the basis for publication(s) in peer-reviewed journals. The student is encouraged to discuss both the substance and the preparation of the dissertation with members of the dissertation faculty committee well in advance of the planned defense date. Detailed instructions on the form of the dissertation and abstract may be obtained from the Graduate Division.

***a. Final Examination***

The Ph.D. dissertation defense consists of an open seminar on the dissertation work followed by a closed-door examination by the dissertation committee. During the examination, the student is expected to explain the significance of the dissertation research, justify the methods employed, and defend the conclusions reached. At the conclusion of the examination, the committee shall vote on whether both the written dissertation and the student's performance on the exam are of satisfactory quality to earn a University of California Ph.D. degree. A unanimous vote is required for a pass. Members of the committee may vote to make passing the exam contingent on corrections and/or revisions to the dissertation. In this case, the committee will select one member, normally the graduate research advisor, who will be responsible for approving the final version of the dissertation that is submitted to Graduate Division. All members of the dissertation committee must sign the final dissertation

***b. General Requirements***

The submission of the dissertation is the last step in the program leading to the award of an advanced degree. All dissertations submitted in fulfillment of requirements for advanced degrees at UCM must conform to certain University regulations and specifications with regard to format and method of preparation. The UCM Thesis and Dissertation Manual are available at the Graduate Division website. The Doctoral Committee certifies that the completed dissertation is satisfactory through the signatures of all Committee members on the signature page of the completed dissertation. The doctoral committee chair is responsible for the content and final presentation of the manuscript.

Filing instructions are found in the UCM Thesis and Dissertation Manual. The advanced degree manuscript is expected to be submitted by the deadline in the semester in which the degree is to be conferred. The end of the semester is the deadline for submitting dissertations during each semester. Those students who complete requirements and submit dissertations after the end of the semester and prior to the start of the subsequent semester will earn a degree for the following semester, but will not be required to pay fees for that semester. In accordance with UC and UCM policy, all approved thesis/dissertation manuscripts automatically become available for public access and circulation as part of the UC Libraries collections.

**c. *Dissertation***

The research conducted by the student must be of such character as to show ability to pursue independent research. The dissertation reports a scholarly piece of work of publishable quality that solves a significant scientific problem in the field and is carried out under the supervision of a member of the program while the student is enrolled in the program. The chair of the doctoral committee must be a member of the program and must be immediately involved with the planning and execution of the experimental work done to formulate the dissertation.

Students should meet regularly with their dissertation committee. The dissertation must be submitted to each member of the dissertation committee at least one month before the student expects to make the defense. Informing committee members of progress as writing proceeds helps the members to plan to read the dissertation and provide feedback. The dissertation must be approved and signed by the dissertation committee before it is submitted to Graduate Division for final approval.

**3.10 Normative Time to Degree:** The ME graduate group places a nominal time limit of five years from entrance to completion of the Ph.D. degree for students entering the program without an M.S. degree in mechanical engineering or a closely related field. Normative time for the pre-candidacy period is three years, and two years for the candidacy period. Ph.D.

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students entering with an M.S. degree in mechanical engineering, or a closely related field, have a nominal time limit of four years. Extensions beyond these limits can be permitted by the Chair of the ME Graduate Program in consultation with the Executive Committee of the Program.

### **3.11 Typical Timeline and Sequence of Events:** Typically, students take graduate courses for the first two years of the degree, enrolling primarily in research units thereafter.

A sample direct Ph.D. course plan for a student entering the program without an M.S. degree is described below.

<b>Year</b>	<b>Fall Semester</b>	<b>Spring Semester</b>
<b>1</b>	ME 241: Advanced Dynamics (4) MATH 223: Asymptotics and Perturbation Methods (4) ME 295: Graduate Research (3) ME 291: ME Seminar Series (1)	ME 211: Nonlinear Controls (3) MATH 231: Numerical Solution of Differential Equations I (4) ME 295: Graduate Research (5) Pass Preliminary Exam
<b>2</b>	ME 231: Conduction Heat Transfer (4) ME 280: Fractional Order Mechanics (4) ME 295: Graduate Research (4)	ME 220: Continuum Mechanics (3) ME 232: Convective Heat and Mass Transfer (3) ME 295: Graduate Research (6)
<b>3</b>	ME 295: Graduate Research (11 units) ME 291: ME Seminar Series (1)	ME 295: Graduate Research (12 units) Complete research proposal and pass oral Qualifying Exam
<b>4</b>	ME 295: Graduate Research (12 units)	ME 295: Graduate Research (12 units) Open Technical Seminar
<b>5</b>	ME 295: Graduate Research (12 units)	ME 295: Graduate Research (12 units) Complete and defend dissertation

**3.12 Sources of Funding:** Graduate students who received a funding offer with their admissions offer will have their financial support according to the terms of the funding offer. Funding will come through a combination of Teaching Assistantships, Graduate Research Assistantships, and/or Fellowships. Master's students are typically not expected to be funded by such means; but they may receive a funding offer with their admissions offer. More information on financial support can be found in the [Graduate Policies and Procedures Handbook](#).

### **3.13. Change of Degree Level (Ph.D. to Masters)**

In some cases, a doctoral student may choose to leave the program with a Master's degree only. It is the responsibility of the Graduate Group unit to notify the Graduate Division via the Change of Degree form so that the student's record may be updated to reflect the student's degree status.

This notice must include the student's written permission to have his/her degree objective changed officially from doctorate to Master's.

#### **4. General Information**

##### **4.1. PELP, In Absentia and Filing Fee status.**

Information about PELP (Planned Educational Leave Program), In Absentia (reduced fees when researching out of state), and Filing Fee status can be found in the Graduate Group Policies and Procedures Handbook, available on the Graduate Division Website.