

Mechanical Engineering Program
Policies and Procedures

For M.S. and Ph.D. Degrees in Mechanical Engineering
At the University of California, Merced

Submitted by:

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**MECHANICAL ENGINEERING GRADUATE GROUP
Ph.D. AND MS DEGREE REQUIREMENTS**

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A. Introduction

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 mechanicians 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.).

2) **Admissions Requirements:**

Consideration for graduate group admission requires a bachelor's degree, three letters of recommendation, official transcripts, GRE scores, 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 of these criteria does not guarantee admission, but merely eligibility.

Academically qualified students may also be required to complete a telephone 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.). A graduate applicant for ME can be granted conditional admission pending remedial classes that would allow the student to take the graduate classes in the program.

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

- a) **Prerequisites:** There are no general prerequisites for admission. However, if the bachelor's degree of an applicant is not in ME, he or she may be required to take some basic higher level undergraduate mechanical engineering courses to make up for the coursework deficiencies. There is no specified list of these courses and the situation of a student is handled on a case by case basis.
 - b) **Deficiencies:** Coursework deficiencies should be made up by the end of the first academic year following initial enrollment by earning a letter grade of "B" or better.
- 3) **General Committees:** The Executive Committee and Graduate Group chair will appoint members to the following standing committees at the beginning of the Fall term. The Executive Committee and Chair may choose to not constitute a particular committee as a separate body, in which case the Executive committee and chair will assume the responsibilities of that committee. Committee formation and appointments will be reviewed on an annual basis.
- a) **Executive Committee (EC):** The Executive Committee (EC) shall, in consultation with the faculty, determine and implement policy for the good of the Group, establish and guide the educational requirements of the Group, and represent the interests of the Group to University and other agencies. To ensure broad participation and input every effort will be made to have EC membership from at least two Schools. The EC will make appointments to the other committees and approve membership in the ME graduate Group.
 - b) **Membership Committee:** The Membership Committee will be responsible for reviewing applications from faculty who wish to be part of the Group. In addition, the Committee will review the membership of the Group every four years. The Membership committee will recommend approval or denials for membership to the EC.
 - c) **Education Policy Committee:** The Committee on Educational Policy (EPC) is responsible for establishing and guiding the educational programs of the Group. The EPC will be formed by the Executive committee and will conduct annual reviews of the programs. The EPC in consultation with the group faculty will determine changes in programmatic requirements of the ME graduate group.
 - d) **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.

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B. 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.

1) Degree Plan I- Thesis: This plan requires a minimum of 29 semester units in approved graduate 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, 8 units of research and 1 unit of ME seminar is required for MS Plan 1. A written thesis and oral defense is also required.

a) 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; under guidance, are 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.

b) Course Requirements - Core and Electives (total 29 units)

i) Core Courses (total 29 units)

Course Number	Course Name	Units
ME 200-289 (or graduate level)	Mechanical Engineering (or other majors as appropriate) Graduate Courses	20

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courses in other majors as appropriate)		
ME 291	Mechanical Engineering Seminar Series	1
ME 295	Graduate Research	8

ii) Elective Courses (total 0 units)

There are no Elective course requirements.

iii) Summary: 20 units of core coursework, 8 units of research, and 1 unit of ME Seminar are required for a total of 29 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 for Plan I). 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

c) Special Requirements: "N/A."

d) Advancement to Candidacy: In accordance with University of California policy, students must be advanced to candidacy for their degree prior to the beginning of the final semester of enrollment. In addition, a student must have maintained a minimum GPA of 3.0 in all course work undertaken. An Application for Advancement to Candidacy initiated by the student and approved by the Graduate Group should be submitted to the Graduate Dean before (preferably 30 days before) the opening of the semester in which the degree is expected. The Application must be accompanied by petitions for any course credits that have not already been approved by the Graduate Dean. Membership of the thesis committee must be included, and the ME Chair, Faculty Advisor, and the graduate student must sign the Statement of Conflict of Interest form, which is included in the Application.

e) Thesis and Defense Requirements: The student will prepare a written thesis under supervision of their faculty advisor until the work is judged 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

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least two weeks 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, and one copy of the thesis must be filed with the Graduate Division no later than two weeks before the scheduled date of the thesis defense.

The thesis defense consists of an 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 simple majority 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.

- 2) Degree Plan II- Non-thesis:** This plan requires a minimum of 29 semester units in approved graduate courses, at least 28 of which must be earned in letter graded 200-series graduate-level courses exclusive of credit given for thesis research and preparation. In addition, 1 unit of ME seminar is required for MS Plan II. A comprehensive examination is also required.
- a) 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; under guidance, are 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.

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- v) Able to communicate effectively through oral, visual, and written means, with a broad range of technical audiences.

b) Course Requirements - Core and Electives (total 29 units)

i) Core Courses (total 29 units)

Course Number	Course Name	Units
ME 200-289 (or graduate level courses in other majors as appropriate)	Mechanical Engineering (or other majors as appropriate) Graduate Courses. At least 21 units must be completed in Mechanical Engineering Graduate Courses.	28
ME 291	Mechanical Engineering Seminar Series	1

ii) Elective Courses (total # units)

There are no Elective course requirements.

- iii) **Summary:** 28 units of core coursework and 1 unit of ME Seminar are required for a total of 29 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 21 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. Courses that fulfill any of the graduate group course requirements may not be taken S/U (with the exception of ME 291) 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.

c) Special Requirements: "N/A"

- d) **Advancement to Candidacy:** In accordance with University of California policy, students must be advanced to candidacy for their degree prior to the beginning of the final semester of enrollment. In addition, a student must have maintained a minimum GPA of 3.0 in all course work undertaken. An Application for Advancement to Candidacy initiated by the student and approved by the Graduate Group should be submitted to the Graduate Dean before (preferably 30

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days before) the opening of the semester in which the degree is expected. The Application must be accompanied by petitions for any course credits that have not already been approved by the Graduate Dean. Membership of the thesis committee must be included, and the ME Chair, Faculty Advisor, and the graduate student must sign the Statement of Conflict of Interest form, which is included in the Application.

- e) **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 capstone requirement 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 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. The exam will comprise problems from tests or assignments given to the student while taking ME graduate courses towards the unit requirement. As such, exam problems will be graded by instructors of the graduate courses. The ME Graduate Group Chair will compile all available grades and, in collaboration with two ME faculty committee members, determine the outcome. Students must be registered or in current filing fee status to take the examination.

- i) **Timing:** Students may take the comprehensive examination once they have advanced to candidacy. However, it is important that the timing of the exam satisfy the regulations as noted in the CCGA handbook, which indicates that the capstone requirement be completed at or near the end of the coursework for the Master's degree.
- ii) **Outcome:** Examinations can result in either a pass, fail, or partial pass by unanimous consensus of the Comprehensive Examination Committee. 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

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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 to the Graduate Council via the Vice Provost and Dean of Graduate Education within 30 days.

3) Degree Plan- Professional Masters

Policies and Procedures for Professional Masters programs are in development at the campus level.

- 4) Advising Structure and Mentoring:** 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](#).

- 5) Master's Degree Committees:** List all committees that are relevant to a Master's education in your program, for example the Thesis Committee, Comprehensive Committee, etc. Please be sure these committee descriptions are consistent with your bylaws.

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- a) **Thesis Committee:** M.S. thesis committees in the ME Group typically consist of three 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 two or more others are UC Merced faculty members in the ME group (one of whom is appointed as Committee Chair). 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 must be in attendance (either in person or remotely) for the M.S. thesis defense. 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

- b) **Comprehensive Examination Committee:** The student, in consultation with his/her graduate advisor and graduate group chair, will nominate three faculty to serve on the Comprehensive Examination Committee. These nominations are submitted to the Graduate Division for formal appointment in accordance with Graduate Council policy. Usually one of the committee members directs the examination

- 6) **Normative Time to Degree:** The ME graduate group places a nominal time limit of two years from entrance to completion of the M.S. degree. Extensions beyond these limits can be permitted by the Chair of the ME Graduate Program in consultation with the Executive Committee of the Program.

- 7) Typical Timeline and Sequence of Events:

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

Year	Fall Semester	Spring Semester
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1	ME 202: Transport Phenomena (3) ME 231: Conduction Heat Transfer (3) ME 229: Tribology (3) ME 295: Graduate Research (1) ME 291: ME Seminar Series (1)	ME 220: Continuum Mechanics (3) ME 232: Convective Heat and Mass Transfer (3) ME 295: Graduate Research (5)
2	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

Year	Fall Semester	Spring Semester
1	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)
2	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.

- 8) Sources of Funding:** M.S Students are typically supported by TA or GSR during their graduate studies. Incoming students are often supported during their first year by a TA. Then, during the second year, assuming their academic and (if applicable) research performance was acceptable during the first year, students will be supported by a TA or GSR. The funding source will be determined by the student's advisor. There are no minimum or maximum limitations on Teaching Assistantships. Lastly, support for student travel to conference may be available through the Graduate Group's USAP funding each year.

C. 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.

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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; 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.

2) Course Requirements - Core and Electives (units vary)

There are 3 options for students to obtain their Ph.D.; Post M.S., MS and Ph.D, and Direct Ph.D. Each option has different unit requirements. Please note that courses taken toward a graduate degree at another institution cannot be transferred for credit toward a Ph.D. at UCM. However, a course requirement may be waived if a similar course was taken at another institution. The General Petition form should be used for all requests for waivers of course work.

a) Post M.S. (14 units minimum)

Students entering the Ph.D. program with a completed M.S. degree must complete at least four semesters of full-time academic residence and the following courses:

Course Number	Course Name	Units
ME 200-289 (or graduate level courses in other majors as appropriate)	Mechanical Engineering (or other majors as appropriate) Graduate Courses	12
ME 291	Mechanical Engineering Seminar Series	2

b) M.S. and Ph.D. (43 units minimum)

Students whose degree objective is a Ph.D. but who wish to also receive an M.S. from UC Merced must complete all requirements for an M.S. degree either Plan I or II in addition to the requirements for the Post M.S. degree described above. The minimum number of units required under this plan is 43.

b) Direct Ph.D. (34 units minimum)

Students entering the Ph.D. program with a Bachelor's degree and do not intend

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to pursue a M.S. en route must complete at least six semesters of full-time academic residence and the following courses:

Course Number	Course Name	Units
ME 200-289 (or graduate level courses in other majors as appropriate)	Mechanical Engineering (or other majors as appropriate) Graduate Courses	32
ME 291	Mechanical Engineering Seminar Series	2

- c) **Summary:** 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 for Plan I) 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) Special Requirements:

- a) **Teaching Requirement:** All students pursuing a Ph.D. degree in ME are required to complete at least one semester as Graduate Student Instructor (also known as Teaching Assistant or TA).
- b) **Language Requirement:** N/A
- c) **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.
- d) **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

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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.

- 4) Dissertation Plan:** In accordance with University of California policy, a minimum of four semesters in academic residence is required prior to awarding the Ph.D. Typically, a longer period of study, four to six years, is required for completion of all degree requirements. It is the responsibility of the Graduate Group to inform the student upon admission to the program of the expected degree time. All graduate students are considered resident graduates not candidates for a degree, unless admitted to candidacy after completion of all candidacy requirements and approval by the Graduate Division after formal application. A student advances to candidacy for the Ph.D. upon successfully demonstrating a high level of scholarship at the Ph.D. level, and upon completing all preparatory work and demonstrating readiness to proceed to the dissertation phase.
- 5) Advising Structure and Mentoring:** The graduate advisor is the faculty member who supervises the student's research and dissertation. 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](#).
- 6) Doctoral Degree Committees:**
 - a) Preliminary Examination Committee:** The Preliminary Examination Committee is charged with administering the examination. A minimum of two questions in each chosen ME examination topics will be posed and graded by a committee of ME faculty members familiar with the field. 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 three ME faculty to serve on the Candidacy Committee. These nominations are submitted to the Graduate Group Chair for formal appointment in accordance with Graduate Council policy. 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,

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research outline, and progress summary and timeline, no later than 2 weeks 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 two or more others are UC Merced faculty members in the ME group (one of whom is appointed as Committee Chair). Under some circumstances 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. However, participation of an external (fourth) member in the Ph.D. dissertation committee is strongly encouraged.

All members of the committee must be in attendance (either in person or remotely) for the Ph.D. dissertation defense. 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.

- 7) **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 and pay the candidacy fee in order to be officially promoted to Ph.D. Candidacy.

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8) 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 during the spring break each spring semester. A student wanting to take the exam must sign up for it with the ME Graduate Group no later than 4 weeks before the final day of classes of the semester before the exams will be taken.

The preliminary examination may be offered also in the fall semester under special circumstances only and subject to ME faculty approval.

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 6-hour examination. The examination will be followed by a 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. If agreed unanimously by the committee the student may be allowed to make minor modifications prior to submitting the results of the examination.
- **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,

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consisting only of the focus areas that were not passed the first time; the second examination may have a format 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.

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

9) 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 written dissertation 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 2 weeks 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

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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.

- 8) Dissertation Requirements:** The Ph.D. dissertation must be a 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. Usually, the committee consists of three members, two of whom are from the major area and one from a different area. 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 simple majority 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.

- 9) 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. 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.
- 10) 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.

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Year	Fall Semester	Spring Semester
1	ME 241: Advanced Dynamics (4 units) 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 (4) Pass Preliminary Exam
2	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 (4)
3	ME 295: Graduate Research (11 units) ME 291: ME Seminar Series (1)	ME 295: Graduate Research (12 units) Complete dissertation research proposal and pass oral Qualifying Exam
4	ME 295: Graduate Research (12 units) Teaching assistant	ME 295: Graduate Research (12 units) Open Technical Seminar
5	ME 295: Graduate Research (12 units)	ME 295: Graduate Research (12 units) Complete and defend dissertation

11) Sources of Funding: ME graduate students are supported by several mechanisms. In order to attract excellent graduate students, it is essential for the ME graduate program to be able to offer prestigious and competitive fellowship support to first-year and continuing graduate students. We are happy to note that UC Merced Graduate Division sponsors competitive fellowships for Ph.D. students as listed below:

- a. Eugene Cota-Robles Fellowship
- b. Chancellor's Fellowship
- c. Fletcher Jones Fellowship
- d. Faculty Mentor Program Fellowship
- e. Miguel Velez Scholarship
- f. President's Dissertation Year Fellowship
- g. Graduate Dean's Dissertation Year Fellowship

The allocated funding to the ME graduate program is also spent as fellowships for attracting new graduate students and awarding successful and productive current students.

The ME graduate program also currently has Teaching Assistant (TA) positions for undergraduate courses each year that are used to support graduate students. Faculty grants and collaborations provide funding for graduate students in the form of Graduate Student Researcher positions and fellowships.

Following advancement to candidacy, doctoral students who are not California residents will have their Nonresident Tuition reduced by 100 percent for a maximum of three consecutive calendar years. Any such student who continues to be enrolled or

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who re-enrolls after receiving the reduced fee for three years will be charged the full Nonresident Tuition that is in effect at that time.

Admission to ME does not imply any form of financial support. However, a variety of fellowships and employment options are available on a competitive basis for selected outstanding candidates. Employment possibilities for graduate students include Teaching Assistant (TA) positions, and Graduate Student Researcher (GSR) appointments. TA stipends and required qualifications are set by the school offering the position, while GSR stipends and required qualifications are determined by the faculty member offering the position. Graduate students pursuing a Ph.D. degree with external fellowships are still required to satisfy the one semester teaching requirement. Financial support provided through TA or GSR appointments is subject to periodic review and can be modified or revoked according to the appropriate regulations implemented at UC Merced.

- 12) Leaving the Program Prior to Completion of the PhD Requirements:** A student admitted for the Ph.D. degree, which, in the judgment of the unit's graduate affairs committee should not continue past the master's degree, must be notified in writing by the Graduate Group Chair of the Graduate Group offering the degree. A copy of the letter must be sent to the Vice Provost and Dean of Graduate Education. 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.

D. General Information

- 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.