MECHANICAL ENGINEERING, PH.D.

While pursuing a Doctor of Philosophy (PhD) degree in mechanical engineering, the student will take graduate-level courses and conduct research with a faculty advisor and observe how these studies will lead to key engineering innovations and societal impacts in the field of mechanical engineering. Equipped with complementary and state-of-the-art computational and experimental facilities, the Mechanical Engineering Department has active research programs in the following three disciplinary groups; Dynamic Systems & Control (DSC), ThermoFluids Science (TFS), and Materials Processing & Manufacturing (MPM). Faculty teach graduate-level courses and conduct research in cross-disciplinary research thrust areas that include: automotive systems, robotics and human systems, automation and mechatronic systems, energy and building efficiency, internal combustion engines, manufacturing systems, additive manufacturing, and materials processing and modeling. Graduate courses in these areas, in addition to the general core graduate courses, provide the foundation for earning a PhD degree in mechanical engineering. The student must demonstrate mastery of the selected study area through the qualifying exam, the proposal of a research topic, and the defense of a research-based dissertation. In addition to conducting research, the student also gains teaching experience through a practicum.

In addition to the traditional on-campus degree offering, the PhD program in mechanical engineering is also offered via the online option. The online option is available to students residing within the United States or serving abroad at a U.S. military installation, with performance expectations being identical to those of the on-campus program. For more information on the online PhD in Mechanical Engineering, see the departmental web page as well as the UA Online Degree Program. We are confident that online education students have a great opportunity to obtain their degrees with minimal travel or job disruption. Applicants interested in the online option are encouraged to contact faculty members in the area of research interest to inquire about the formulation of a research project suitable for completion via online education as well as any on-campus visits that individual faculty may require.

Students and faculty in the Department of Mechanical Engineering have access to state-of-the-art computational facilities and experimental capabilities. On-campus assets include numerous commercially available computational modeling software packages. In addition, high performance computing capabilities are accessible through The University of Alabama's Office of Information Technology. The department also has many state-of-the-art experimental facilities available for daily use by graduate students.

Qualified students in the Mechanical Engineering undergraduate program at The University of Alabama are eligible for early admission into the PhD program through the Accelerated Masters Program (AMP). This program allows students to double-count up to 9 hours of graduate credit toward their undergraduate degree.

Admission Application Deadlines

The Department of Mechanical Engineering only offers admission in the Fall semester. The application deadline for admission to the Fall semester is December 1 of the preceding year.

The application deadline is administered in order to allow enough time to properly process application and (if admitted) process visa, funding, and on-boarding paperwork. As such, the application deadline is absolute, and no application will be considered after the deadline. Applicants who submit after the deadline will be considered for the following year.

Application Package and Materials

Students may apply to the PhD program having completed either a BS degree in Mechanical Engineering or a closely related field (i.e., directadmit), or a BS and MS degree in Mechanical Engineering or a closely related field. In addition to the Graduate School's general application requirement for advanced degrees, applications require and/or are judged upon the following (note that these are minimum requirements for review of application, not admission to the program):

- A minimum of 3.5 GPA in the students last-completed degree.
- A current CV.
- A concise statement of purpose describing interests in an advanced degree, research interests, and faculty interests.
- Three letters from recommenders, including previous faculty or supervisors (note: this is waived for applicants from the UA BSME or MSME).
- If you are a non-native English speaker, you may be required to submit an English language score report. Please consult the UA Graduate School catalog for further information.
- Distance learning applicants only: A residence within the borders of the US or serving on a US military installation.

Applicants Without a Prior Mechanical Engineering Degree

Applicants who hold a BS or MS degree in a discipline other than Mechanical Engineering may apply for admission to the PhD program. However, there is a basic level of undergraduate understanding that applicants are expected to have upon entering the program. The following prerequisite undergraduate courses (or acceptable equivalents) are expected:

- Mathematics: Calculus (usually 12 semester credit hours and Ordinary Differential Equations)
- Chemistry: General Chemistry (usually 4 semester credit hours)
- · Physics: Calculus-Based Physics (usually 8 semester credit hours)

Further, individual advisors/dissertation committee chairs reserve the right to require admitted students to take undergraduate coursework necessary for students to gain understanding in foundational topics. Credit in undergraduate coursework will not count toward any curricular requirements for PhD or MSME degree completion.

Curricular Requirements

Curriculum Overview

The PhD in Mechanical Engineering is obtained by successfully completing the following requirements (in approximate order of completion):

- Form dissertation committee, which may be revised at any time during a student's studies (see section: Formation of Committee).
- Complete 39 hours of coursework, where:
 - 18 credit hours are in a major area, of which 9 hours may be in approved, closely related supporting fields upon written request and approval of the Department (see subsection: Coursework Requirements).

- 9 credit hours are in any minor technical area (see subsection: Coursework Requirements).
- No more than 18 credit hours of coursework may be transferred from previous graduate studies (see section: Transfer Credit).
 Note that 30 credit hours may count toward an en route MSME degree (see section: En route MSME Degree).
- Each student is required to complete a mentored instruction experience, which includes successful completion of ENGR 501 (See subsection: Mentored Instructional Experience).
- Be admitted to candidacy by passing the Qualifying Examination/ Research Proposal (see section: Admission to Candidacy).
 - Students must be in the process of completing at least 24 credits toward the required 39 to be admitted to candidacy.
 - The entire dissertation committee must submit a "Graduate Outcome Assessment" form to the Graduate Program Director in the Department of Mechanical Engineering prior to departmental approval for the "Admission to Candidacy" form.
 - The advisor/dissertation committee chair must submit the "Admission to Candidacy" form to be approved by the Graduate Program Director in the Department of Mechanical Engineering, as well as the Graduate School.
 - The Qualifying Examination / Research Proposal is not considered passed until the "Admission to Candidacy" form is finalized.
 - Students must be admitted to candidacy at least nine months prior to their final Dissertation Defense.
- Pass 18 credit hours of ME 699 Dissertation Research.
 - Students may not register for ME 699 until the semester after which the "Admission to Candidacy" form is finalized.
 - ME 699 is Pass/Fail, does not impact GPA, and does not count toward the 39 credit hours of required coursework.
 - Credit hours of ME 698 do not count toward the requirement of 18 credit hours for ME 699.
 - Note: there is a continuous registration requirement for ME 699 (see subsection: Continuous Enrollment Policy).
- Present, defend, and upload the final dissertation along with the required electronic forms to the Graduate School website prior to the deadline for graduation in the desired semester (see section: Dissertation Requirements).
 - Students must be in the process of completing all curriculum requirements
 - The entire dissertation committee must submit a "Graduate Outcome Assessment" form to the Graduate Program Director in the Department of Mechanical Engineering prior to departmental approval of the "Final Defense" form. this is in addition to the submission of the "Graduate Outcome Assessment" form at the time of the Qualifying Examination/Research Proposal.
 - The advisor/dissertation committee chair will submit the "Final Defense" form, to be approved by the Graduate Program Director in the Department of Mechanical Engineering, as well as the Graduate School.

Coursework Requirements

All PhD students in Mechanical Engineering must complete the minimum of 39 non-dissertation credit hours of coursework and the minimum of 18 credit hours of post-Admission to Candidacy dissertation research through the following four areas, and no more than 50% of these courses being from outside Mechanical Engineering (ME) without approval by the advisor/dissertation committee.

Ph.D. Curriculum Requirements	Hours
1. Major Core Area	21
ME 500-level and/or	
ME 600-level and/or	
AEM 500-level and/or	
CE 500-level, and/or	
CHE 500-level, and/or	
CS 500-level, and/or	
ECE 500-level and/or	
GES 500-level, and/or	
MTE 500-level.	
Note that other courses require advisor approval.	
2. Minor Technical Area	9
ME 500-level, and/or	
ME 600-level, and/or	
AEM 500-level, and/or	
CE 500-level, and/or	
CHE 500-level, and/or	
CS 500-level, and/or	
ECE 500-level and/or	
GES 500-level, and/or	
MTE 500-level.	
Note that other courses require advisor approval.	
3. Elective Area	9
ME 500-level, and/or	
ME 600-level, and/or	
AEM 500-level, and/or	
CE 500-level, and/or	
CHE 500-level, and/or	
CS 500-level, and/or	
ECE 500-level and/or	
GES 500-level, and/or	
MTE 500-level.	
Note that other courses require advisor approval.	
4. Dissertation Research	18
ME 699 Dissertation Research	
*Restrictions and Notes	
1. At least 50% of the 39 non-dissertation coursework credit	
hours must be ME 500- or 600-level.	
2. Students are limited to only 6 credit hours of ME 591/594/691/694 courses per instructor/faculty member.	
3. Students are limited to a total of only 6 credit hours of ME 594/694 courses.	
4. ME 698 (Non-Dissertation Research) will not count toward the total hours required in this table.	
Total Hours	57

Mentored Instructional Experience

In their careers, PhD engineers are expected to be thought leaders, mentors, trainers of other developing professionals, and communicators with a variety of audiences. Therefore, in addition to technical training in their discipline, all UA College of Engineering PhD students will have a Mentored Instructional Experience (MIE) that will enhance their abilities in these critical areas of communication, giving and receiving formal feedback, mentoring, and training, as well as deepen their discipline-specific knowledge through educational support experiences (typically office hours, laboratory instruction, conducting recitation, preparing instructional materials, and guiding in-course design teams of undergraduate students).

All PhD students will receive pedagogical training in these instructional support areas through a pedagogy practicum course. Students will be required to take one semester of ENGR 501 Engineering Instruction Prep, which will not count towards the 39 credit hours of required coursework or the 18 credits of dissertation research (ME 699) required for the PhD degree. In addition, each student shall complete a set of instructional experiences during designated semesters (2 semesters at 10 hours/ week, 4 semesters at 5 hours/week, or the equivalent) under the guidance of a faculty mentor.

This additional instructional practice is a graduation requirement.

Restrictions on 59X/69X Courses

Of the minimum 39 credit hours or coursework necessary for the PhD, student may take a maximum of 6 hours of either ME 591/ME 691 Special Topics or ME 594/ME 694 Independent Research Topics from any single professor in any department (i.e., a student may take more than 6 credit of ME 591/ME 691 if they are from course offerings from multiple professors, though students are limited to a total of 6 credits of ME 594.

Graduate Seminar

All PhD students, irrespective of year of graduate studies, are required to attend all graduate seminars hosted by the Department of Mechanical Engineering, with a minimum of 75% attendance. Each semesters' list of graduate seminars will be published on the department website prior to the start of the semester and disseminated to students via email.

Minimum Credit Enrollment Requirements

All students funded by GRA or GTA, or students holding international visas, must register for at least 6 graduate-level credit hours during the semester. Note that if it is the student's final semester, they may register for a reduced number of ME 699 credits (see subsection: Continuous Enrollment Policy).

For whatever reason if a student is below 6 credit hours (e.g. lack of relevant courses, completion of required coursework), but has not yet met the requirements to being registering for ME 699 (i.e., their "Admission to Candidacy" form has not received final approval), they may register for ME 698, which will not count toward any curricular requirements, neither the 39 credit hours necessary for coursework nor the 18 credit hours of ME 699.

Continuous Enrollment Policy

Graduate School Information on the Continuous

Enrollment Policy (Continual Doctoral Research Hours Registration) can be found here.

Student Progress Requirement

Students are expected to maintain satisfactory academic progress each semester. Students that do not remain in good academic standing and/ or fail complete their assigned research in a satisfactory manner may be dismissed from the program.

Transfer Credit

For students entering the PhD program with prior graduate-level coursework in Mechanical Engineering or a closely related field, maximum of 18 credit can be transferred toward the PhD program's

minimum requirement of 39 credits. In general, the transfer of course hours is subject to approval by both the Department of Mechanical Engineering as well as the Graduate School. Transfer credit requests are submitted electronically, as described below, only after the start of classes and within a student's first year.

For students that completed an MS degree prior to entering the PhD program, they may opt for a block transfer of credit. For students that did not complete an MS degree prior to entering the PhD program, they will be required to find the closest equivalent course at the University of Alabama for transfer on a course-by-course basis.

Students are required to initiate the process of credit transfer via the "Request for Transfer of Graduate Credit" form. For students whose prior graduate-level coursework was completed more than 6 years prior to their UA PhD admission date, they must initiate the process via the "Field-Related Employment Since Earning Master's Degree" form. Forms regarding credit transfer can be accessed here.

Formation of Dissertation Committee

Students must identify an advisor who will serve as their dissertation committee chair, as well as professors who will serve on their dissertation committee. Students are required to initiate the "Appointment/Change of Doctoral Dissertation Committee" form. An approved and up-to-date form must be on file with the Graduate School before both the student's Qualifying Examination/Research Proposal and Dissertation Defense. The form can be access here.

The makeup of the dissertation committee is left to the student and their advisor/dissertation committee chair, granted that the dissertation committee comprises:

- An advisor/dissertation committee chair who is a professor or adjunct professor in the Department of Mechanical Engineering.
- At least five dissertation committee members in total, including the advisor/dissertation committee chair.
- A majority of member who are part of the graduate faculty in the Department of Mechanical Engineering.
- At least one external member, who can be a professor in a department outside of the Department of Mechanical Engineering, or a member external to the University of Alabama, granted that they have a PhD in Mechanical Engineering or a closely related field.

Admission to Candidacy

To be admitted to candidacy, students must successfully complete a Qualifying Exam/Research Proposal as described below. Note that students cannot complete their Qualifying Exam/Research Proposal or be admitted to candidacy until the semester in which they are completing at least 24 credit hours towards the total 39 credit hours necessary for degree completion. The Qualifying Exam/Research Proposal is not considered complete until:

- The student has completed their Qualifying Exam/Research Proposal and their dissertation committee has voted to pass.
- The dissertation committee has completed the "Graduate Outcome Assessment" form.
- The advisor/dissertation committee chair has completed the "admission to Candidacy" form and the form has been approved by both the Graduate Program Director in the Department of Mechanical Engineering as well as the Graduate School.

Qualifying Examination/Research Proposal

The specific format of the Qualifying Examination/Research Proposal is at the discretion of their dissertation committee, granted that there is an oral presentation associated with the Qualifying Examination/ Research Proposal, and the student completes a Course Portfolio. While the Qualifying Examination component may be satisfied as part of the Research Proposal oral presentation, the dissertation committee may choose other avenues, including (but not limited to) a traditional written examination, an oral examination, a written paper, etc.

Note that Admission to Candidacy must be earned no earlier than the semester in which the student is completing at least 24 credit hours towards the total 39 credit hours necessary for degree completion, and at least nine months prior to the Dissertation Defense date. Also note that the Qualifying Examination/Research Proposal is not considered complete until finalization of the "Admission to Candidacy" form. Furthermore, student must have a finalized "Admission to Candidacy" form prior to registration of ME 699 Dissertation Research hours. This means, de facto, that the Qualifying Examination/Research Proposal should be take sufficiently prior to the add/drop deadline for the semester in which they plan to enroll in ME 699, to give ample time for the finalization of the "Admission to Candidacy" form. These factors should be considered when consulting with the dissertation committee regarding the specific exam format and timing.

In addition to the specifics of the Qualifying Examination/Research Proposal decided upon by the dissertation committee, the student must also complete and present a Course Portfolio at the time of the Qualifying Examination/Research Proposal, which will be evaluated by the entire dissertation committee and assessed and submitted via the "Graduate Outcome Assessment" form. This evaluation typically occurs when the proposal is presented. The portfolio paperwork is not submitted to the Graduate School.

Upon completion of the Qualifying Examination/Research Proposal, the entire dissertation committee (including the advisor/dissertation committee chair) should complete the "Graduate Outcome Assessment" form. Upon completion by all dissertation committee members, the advisor/dissertation committee chair will then initiate the "Admission to Candidacy" form, which will be vetted and approved by the Graduate Program Director in the Department of Mechanical Engineering as well as the Graduate School.

The Qualifying Examination/Research Proposal may only be taken twice, failing which the student faces dismissal from the PhD program in Mechanical Engineering.

Dissertation Requirements

To successfully complete the Dissertation, student must:

- Have an up-to-date "appointment/Change of Doctoral Dissertation Committee" form on file with the Graduate School (see section: Formation of Dissertation Committee).
- Have been successfully admitted to candidacy at least 9 months prior to the Dissertation Defense date (see section: Admission to Candidacy).
- Complete a Dissertation Defense, comprising an oral presentation and examination defending the dissertation.
- Candidates must provide a written dissertation to the dissertation committee at least two weeks prior to the dense.

- Candidates must initiate the "Public Notice of Dissertation Defense" form at least two weeks prior to the defense.
- The entire dissertation committee must submit a "Graduate Outcome Assessment" form to the Graduate Program Director in the Department of Mechanical Engineering prior to departmental approval of the "Final Defense" form. This is in addition to the submission of the "Graduate Outcome Assessment" form at the time of the Qualifying Examination/Research Proposal.
- The advisor/dissertation committee chair will submit the "Final Defense" form, to be approved by the Graduate Program Director in the Department Mechanical Engineering, as well as the Graduate School.
- The candidate must upload the revised (if necessary) final approved dissertation in one of the approved formats to ProQuest.
- The advisor/dissertation committee chair must initiate, and the entire dissertation committee must complete the "Committee Acceptance Form for Electronic Dissertation".

Note that students are required to complete the oral portion of the Dissertation Defense in person with the full dissertation committee in attendance. In the case of time conflicts, student are expected to reschedule a presentation to minimize the need for virtual participation. in the event it is not possible for all dissertation committee members to attend in person even with rescheduling, a presentation may occur with the student and at least a majority of the dissertation committee participating virtually in accordance with The University's policy on virtual participation. Under extenuating circumstances, when the student and a majority of the dissertation the Graduate Program Coordinator or the Department Head for an exception by providing details as to why rescheduling the event will not enable one of the two acceptable formats to be used.

En Route MSME Degree

PhD students may also pursue an en route MSME degree during their PhD studies. Students who wish to earn an MSME degree en route to their PhD degree must satisfy the MSME degree requirements as specified in that portion of the graduate catalog, including the completion of the ME 598 (note that ME 598 will not count toward any PHD curricular requirements, either the 39 credit hours necessary for coursework nor the 18 hours of ME 699). Upon completion of the MSME degree requirements the student must apply for the MSME degree program (separately from their application to the PhD program).

Per Graduate School restrictions, students with a prior MSME degree may not pursue an en route MSME degree.

AMP to PhD

Current BSME students at UA may pursue the AMP to PhD program, which allows for counting a limited number of coursework credits toward both the BSME and PhD curricular requirements. More information about the AMP program, including program and application requirements can be found here.

In the AMP to PhD program, 9 credits of 500-level or higher coursework can be applied toward the curricular requirements of both the BSME and PhD degrees. Those courses will only count toward the technical electives or ME electives for the BSME degree but will count generally toward the curricular requirements of the PhD degree.

Per Graduate School restrictions, if a student wishes to pursue an en route MSME degree on the way to earning their PhD degree, the 9 credits

of coursework applied to the BSME and PhDs degrees may not be counted to ward the MSME degree. This effectively increases the credit requirement from 39 credit to 48 credits for AMP to PhD students wishing to earn an en route MSME degree. Further, if an AMP to MSME student decides to pursue a PhD degree after completion of their MSME degree, they can only count the 18 credits that were exclusively applied to their MSME degree toward the 39 credits necessary for degree completion.

Plan of Study

Graduate School information on the Doctoral Plan of Study can be found here.

Time Limits for Degree Completion Requirements

Graduate School information on the time limits for degree completion can be found here.

Academic Misconduct Information

The Department of Mechanical Engineering expects all students to be knowledgeable of and adhere to the University's policies on academic conduct, specified here.

Withdrawals and Leave of Absence Information

Graduate School information on withdrawal and leave of absence can be found here.

Academic Grievances Information

University policies on academic grievances can be found here.

Grades and Academic Standing

Graduate School information on grands and academic standing can be found here.

Graduate School Deadlines Information

Graduate School information on deadlines can be found here.

Application for Graduation Information

Graduate School information on application for graduation can be found here.

Admission to the program does not imply that the student will be funded, whether through a graduate teaching assistantship (GTA), graduate research assistantship (GRA) or fellowship. Funding is requested (GTAs), granted (GRAs), or applied for (fellowships) by individual faculty members within the department, and students should contact individual faculty in their area of research to inquire about funding opportunities. Applicants should not contact the Graduate Program Director, Associate Department Head for Graduate Studies, or the Department Head with a request for funding.