

Graduate Student Handbook

Department of Mechanical Engineering
The University of Alabama

March 2016



Note: Each semester, graduate students should check with the Department of Mechanical Engineering office staff to ensure that student contact information is up to date.

Table of Contents

I. INTRODUCTION	1
II. ADMISSION REQUIREMENTS & DEADLINES	1
III. GENERAL INFORMATION	2
A. The University of Alabama	2
B. The Department of Mechanical Engineering.....	3
C. Financial Aid	4
D. Graduate Courses	5
E. Academic Misconduct	5
F. Grades and Academic Standing	6
G. Office Space	7
H. Email and Department Mailboxes	7
I. Assessment of the Department Graduate Program	7
J. Seminar	8
IV. REQUIREMENTS FOR THE MSME DEGREE	9
A. Degree Requirements	9
B. Committees	11
C. Transfer Credit.....	11
D. Comprehensive Examination	12
E. Thesis	12
F. Necessary Paperwork.....	13
G. Time Limits	13
V. REQUIREMENTS FOR THE PhD DEGREE	14
A. Degree Requirements	14
B. Committee	14
C. Transfer Credit.....	15
D. Plan of Study	15
E. Residence Requirements.....	15
F. Dissertation Research Proposal.....	16
G. Comprehensive Qualifying Examination	16
H. Candidacy and Continuous Registration	16
I. Dissertation and Final Examination.....	16
J. Necessary Paperwork.....	17
K. Time Limits	18
APPENDEXES	19
A. Undergraduate Course Requirements for Non-ME Graduates.....	19
B. Guide for Math Courses for Master’s Students	19

I. INTRODUCTION

Welcome to the graduate program in Mechanical Engineering at the University of Alabama. You have embarked on an exciting journey. Advanced engineering study is intellectually stimulating and will prove to be a great asset in your career.

We have prepared this handbook to help you navigate through program and degree requirements and to supply you with additional information that we have found will help you be successful in your studies.

In addition to this handbook, useful information may be found on the follow web sites:

- UA Graduate School (<http://graduate.ua.edu/>),
- Department of Mechanical Engineering (<http://me.eng.ua.edu/>), and
- UA Graduate Catalog (<http://graduate.ua.edu/catalog/>).

Note that the purpose of the Graduate Handbook is to give you a brief outline of various procedures and requirements needed to attain a graduate degree; however, the Graduate School and Mechanical Department sites are the definitive resources for graduate procedures and policies. Note that in all cases, information on the UA Graduate School web site (<http://graduate.ua.edu/>) takes precedent over the information provided in this document.

When questions arise, you should first consult your major advisor. He or she is your primary advocate. The Mechanical Engineering Department Head, Dr. Clark Midkiff (cmidkiff@eng.ua.edu), and the Mechanical Engineering Graduate Program Coordinator, Dr. Steve Shepard (sshepard@eng.ua.edu), will also be happy to help you.

This handbook is divided into 4 sections: General Information, MSME Requirements, PhD Requirements and the Appendixes.

II. ADMISSION REQUIREMENTS & DEADLINES

MSME: For admission to the MSME Program, a prospective graduate student should have:

- a Bachelor's degree in mechanical engineering or related field (Appendix A lists requirements for those with non-ME degrees),
- a grade point average of at least 3.00 on a 4.00 scale, and
- a combined verbal and quantitative GRE requirement of 300 or greater.

There is no minimum score on the writing section of the GRE for admission to the MSME Program. The GRE requirement is waived for current University of Alabama

students applying to the University Scholars Program. All other applicants must submit a GRE score.

PhD: For admission to the PhD Program, a prospective graduate student should have:

- a Master's degree in mechanical engineering,
- a grade point average of at least 3.00 on a 4.00 scale and
- a combined verbal and quantitative GRE requirement of 300 or greater.

There is no minimum score on the writing section of the GRE for admission to the PhD Program.

Direct admission to the PhD Program is available for outstanding applicants who possess a Bachelor's degree in mechanical engineering. For Direct Admit to the Ph.D. program, an applicant must have an undergraduate grade point average of at least 3.3 on a 4.0 scale as computed by The University of Alabama. Current MSME students with a grade point average of at least 3.5 on 4.00 scale and 9 or more graduate credit hours may also apply for early admission to the PhD program with the recommendation of his or her major advisor.

All international applicants must submit TOEFL scores of 580 (229 computerized test, 92 ibt) or higher.

There are no formal deadlines for graduate applications. Once an application is complete, the internal review process typically only takes a few days. However, international students should consider the time required to obtain any necessary travel documents. Only after the student has been accepted and the University has provided the appropriate paperwork can the applicant then apply with their country of origin for these travel documents. Some countries take between two and six months, depending on the country of origin, to then provide the appropriate travel documents. Students must complete this process and arrive on campus prior to the first day of classes. All of these steps should be considered by international student when planning to apply.

III. GENERAL INFORMATION

A. [The University of Alabama](#)

The University of Alabama was established in 1831. The University has an outstanding academic reputation and consistently ranks in the top 50 public comprehensive universities by *US News and World Report*. The current enrollment is over 36,000 students with approximately 5,000 of those in graduate programs. The approximately 1000 acre campus surrounds a large main quadrangle with broad lawns, majestic trees, and shaded walkways. In addition to the nationally renowned athletic programs, the University and the Tuscaloosa community offer a wide range of cultural activities in

theater, art, music, and other creative opportunities. The Tuscaloosa community offers a myriad of recreation and entertainment options with numerous parks, golf courses, galleries, museums, and an active night life with renowned sports bars, restaurants, and night clubs. The Black Warrior River and nearby Lake Tuscaloosa provide opportunities for water recreation.

B. [The Department of Mechanical Engineering](#)

Approximately 1,600 undergraduates and over 65 graduate students are enrolled in mechanical engineering at The University of Alabama. Currently, there are 23 mechanical engineering faculty members. The department has active research programs in automotive engineering, acoustics, biomechanical engineering, combustion, computational modeling and simulation, control systems, energy sciences, energy systems, HVAC, manufacturing, propulsion, vibrations, and vehicle dynamics. Individual faculty members and their research and teaching interest are listed on the ME website, <http://me.eng.ua.edu/people/>. Laboratories and research centers include:

- Alabama Industrial Assessment Center (Dr. Woodbury)
- Applied Controls Laboratory (Dr. Williams)
- Bio-Robotics Laboratory (Dr. Shen)
- Center for Advanced Vehicle Technologies (Dr. Midkiff, Dr. Balasubramanian)
- Combustion and Reactive Flow Laboratory (Dr. Agrawal)
- Computational Mechanics Laboratory (Dr. Volkov)
- High Performance Building and HVAC&R Laboratory (Dr. O'Neill)
- Internal Combustion Engine Laboratory (Dr. Puzinauskas, Dr. Ashford, Dr. Bittle)
- Modeling, Simulation, and Integrated Control Laboratory (Dr. Yoon)
- Nonlinear Intelligent Structures (NIS) Laboratory (Dr. Mahmoodi)
- Process-Structure-Property Laboratory (Dr. Jordon)
- Surface Chemistry and Reaction Dynamics Lab (Dr. Uddi)
- Surface Integrity and Functionality Laboratory (Dr. Guo)
- Precision Manufacturing Research Facility (Dr. Chou)
- Structural Acoustics Laboratory (Dr. Shepard)

Students and faculty in the Department of Mechanical Engineering have access to state of the art computational facilities and capabilities. On-campus assets include numerous commercially available computational modeling packages through the College of Engineering server. In addition, high performance computing capabilities are accessible through the University of Alabama's Office of Information Technology (OIT). Additional information regarding the resources available from the OIT may be found at:

<http://oit.ua.edu/>

High performance computing facilities are available to UA students and faculty through the Alabama Supercomputer Authority (ASA). Information regarding ASA resources and capabilities may be found at:

<http://www.asc.edu/supercomputing/index.shtml>

C. Financial Aid

Many unconditionally admitted full-time graduate students seek and receive some form of financial assistance in the form of a graduate assistantship. Assistantships generally include tuition. Single coverage health insurance will be provided for the Spring 2016 semester. If future IRS regulations permit, single coverage health insurance will be provided while supported on a GRA in future semesters.

Graduate Research Assistantships (GRAs) are awarded by individual professors with funded research. Applicants should communicate directly with a faculty member in the applicant's area of study interest concerning the availability of GRA positions and a potential match.

The ME Department offers Graduate Teaching Assistantships (GTAs) for students assisting faculty members with undergraduate courses and laboratories. GTA awards are determined solely by the ME Department Head. A university-wide requirement for all GTAs is that they should either have English as their native language or have successfully completed an English language proficiency course and passed an English language proficiency exam administered by UA's English Language Institute (<http://www.eli.ua.edu/>). The English language proficiency exam and course process typically required at least one semester.

MSME students supported by assistantships are expected to follow the Plan I Thesis Option, as described in the Graduate Catalog (<http://graduate.ua.edu/catalog/>).

Half-time assistants must register for at least six credit hours of graduate credit and may take up to nine credit hours of graduate courses during the semester. In addition, assistants are expected to perform 20 hours of work per week as part of their position. Accepting an assistantship implies an obligation on the part of the student. Students supported by an assistantship are expected to fulfill their roles as students, meeting all academic requirements, as well as carrying out teaching and/or research assignments. Students who do not maintain good academic standing, as defined in the UA Graduate School, are not eligible for assistantships. Assistantships may also be terminated for unsatisfactory performance of the assigned research and/or teaching duties.

Domestic students may be eligible for student loans and other financial aid and should visit the UA Financial Aid Office website (<http://financialaid.ua.edu/>) to learn more about these options.

Additional support is available in the form of fellowships, available from the University and other funding agencies. Applicants are encouraged to visit Graduate School and Mechanical Engineering websites to learn more about these opportunities, application requirements and deadlines. Some professional societies also offer assistance to new graduate students.

D. Graduate Courses

Graduate courses are those with numbers in the 500-level and 600-level. 500-level courses are intermediate-level courses and are often associated with MSME-level work. 600-level courses are advanced-level courses and are often associated with PhD-level work. However, both MSME and PhD plans of study can contain both 500- and 600-level courses. Graduate courses are listed in the Graduate Catalog (<http://graduate.ua.edu/catalog/24500.html>).

Courses taken for graduate credit generally cannot be repeated. This includes audited courses. Required courses can be repeated for credit if the student makes a D or F grade with the recommendation of the Department Head and the Dean of the Graduate School.

Note that 400-level courses are generally not acceptable for graduate degree requirements. However, there are strict exceptions to this rule as described in Section F below.

Undergraduate students enrolled in the University Scholars program may double count a limited number of graduate course hours as undergraduate electives. More information about his program is available on the Graduate School web site.

E. Academic Misconduct

It is important that students have a clear understanding of what level of group activity is allowable for each assignment. Students should be careful to cite references properly whenever the literature, web, or any work of others is used. Penalties for academic misconduct can range from a grade of zero on the particular assignment to expulsion from the University.

The UA Undergraduate Catalog makes the following statement on academic misconduct.

“Academic misconduct includes all acts of dishonesty in any academic or related matter and any knowing or intentional help, attempt to help, or conspiracy to help, another student commit an act of academic dishonesty. Academic dishonesty includes, but is not limited to, the following acts, when performed in any type of academic or academically related matter, exercise, or activity:

- **Cheating**: using or attempting to use unauthorized materials, information, study aids, or computer-related information
- **Plagiarism**: representing the words, data, works, ideas, computer programs or output, or anything not generated in an authorized fashion, as one's own
- **Fabrication**: presenting as genuine any invented or falsified citation or material
- **Misrepresentation**: falsifying, altering, or misstating the contents of documents or other materials related to academic matters, including schedules, prerequisites, and transcripts”

F. Grades and Academic Standing

Grades in graduate courses are assigned on the A, B, C, D, F system. Plus and minus grades are not used in graduate courses. A weighted grade point average (GPA) is computed using 4 points for A's, 3 for B's, 2 for C's, 1 for D's and 0 for F's. In order to be in good academic standing and to graduate, a student must maintain at least a B average ($GPA \geq 3.0$). Graduate students with 12 or more credit hours and a $GPA < 3.0$ will be placed on academic warning and may not hold a graduate assistantship. To remain in the program, students on academic warning must raise their GPA to 3.0 or better by the end of the semester following being placed on academic warning.

Seventy-five Percent Rule (taken verbatim from the [Graduate Catalog](#)):

“At least 75 percent of the hours taken must have been completed with grades of ‘A’ or ‘B’ at The University of Alabama. In applying this 75 percent rule, a maximum of 6 hours of thesis research may be counted, if appropriate.”

400-Level Courses (taken verbatim from the [Graduate Catalog](#)):

While 400-level courses may be applied toward a master's degree, see Section 4.9 of the Graduate Catalog for some very important considerations that should be noted. For example, approval for such coursework must be obtained before the course is taken. Also, 400-Level Courses may not be accepted for a doctoral degree except when taken as part of the master's degree.

G. Office Space

The location of graduate student office space is coordinated through the ME Department. Graduate student offices are located in the South Engineering Research Center, the North Engineering Research Center, and in Hardaway Hall. Graduate students with questions regarding student office space should contact their faculty advisor.

Cooking and sleeping in offices and laboratories is forbidden. As students often share offices with other students, neatness and respect for others' property should be observed.

H. Email and Departmental Mailboxes

Each University of Alabama student will be assigned an account on the University of Alabama web portal "mybama." This portal includes an email address "yourid@crimson.ua.edu." This crimson e-mail account is the official communication channel between you, The University, and the ME Department. You should check your "mybama" account every day for official announcements, summons, and classroom communications. The student will be held responsible for official communications sent to this email account. You can forward this email to another email account; however, spam filters often delete incoming mail from public email providers such as yahoo.com, hotmail.com, etc. It is, therefore, strongly recommended that you use your "mybama" email.

Each on-campus graduate student will be assigned a mailbox in the ME main office. Your mailbox is an official channel of communication. It is important that you check your mailbox regularly as you will be held responsible for announcements, summons, and other official communications that have been placed in that mailbox. The departmental Administrative Secretary will help you with the assignment of a mailbox.

I. Assessment of the Department's Graduate Program

Over the past few years, the University's primary accreditation agency, the Southern Association of Colleges and Schools (SACS), has added program self-assessment requirements that are to be reported annually. Consequently, the ME department has implemented an annual graduate programs assessment plan.

In order to implement this plan, the department will need you to maintain a portfolio of material from some of the graduate ME courses you take. Assembling such a portfolio should not require more than a minimal amount of additional time, but will require that you utilize your organizational skills along with a continuous commitment to complete the portfolio.

All ME Graduate Students are expected to complete the following in developing their portfolio:

1. **Develop a “plan of study” by the end of your second semester of graduate school.** There are forms and a three-year schedule of future graduate courses that you will want to use in order to develop your “plan of study” in consultation with your advisor.
2. From this plan of study, **you and your advisor will select courses that represent the focus of your graduate studies.** This focus can come from a relationship to your potential thesis or dissertation topic or from the specific field of mechanical engineering in which you have an interest. If you are planning to get a **Master’s degree, choose four courses**; if you intend to obtain a **PhD, choose six courses.**
3. As you progress with your coursework, you will want to **keep portfolios for each of the courses** you chose in step 2. This portfolio is nothing more than a **collection of all the homework sets, projects, and exams.** Keep the portfolio for each course in a **binder.** If you like to keep such material in your personal files, *you can make copies for the portfolio.* Since the course instructors typically retain final examinations, a copy of the final should be obtained for entry into the portfolio.

J. Seminar

The ME department typically holds a seminar series each regular academic term. MSME students are encouraged to present at least one seminar during their graduate tenure. PhD students should expect to present their research more than once during their candidacy. In addition to student presentations, outside speakers distinguished in some area of engineering will be invited to make seminar presentations. Graduate students are expected to attend these seminars.

IV. REQUIREMENTS FOR THE MSME DEGREE

A. Degree Requirements

The Master of Science in Mechanical Engineering (MSME) degree may be obtained through either of two plans. Student may also enroll in the Dual MSME/MBA Degree Program, which includes a slightly reduced number of hours for both degrees.

MSME – Thesis Option (Plan 1): 30 Credit Hours

- The thesis option is the standard master's degree for mechanical engineering. Graduates complete 24 hours of graduate course work, at least six hours of ME 599, and a thesis. All students on teaching or research assistantships in the department are expected to pursue this thesis option.
- A student's curriculum and thesis must be approved by the student's graduate advisory committee. The student must pass a final comprehensive examination, which is typically a presentation and defense of the thesis. In addition, the student must satisfy all University requirements defined in the current edition of The University of Alabama Graduate Catalog (<http://graduate.ua.edu/catalog/>).
- A minimum of 12 semester course hours in the major area at or above the 500 level is required. Major area courses are ME and ME cross-listed courses. Three hours of approved coursework in a closely allied area may be used as a major area course.
- A minimum of 6 hours of mathematics is required. Note that some ME courses may satisfy this requirement as described in Appendix B.
- No more than 6 hours may be at the 400 level. Note that the UA graduate handbook describes important restrictions and requirements regarding use of 400 level hours for a graduate degree.
- A minimum of 6 hours of ME 599 thesis research hours and an approved thesis are required.

MSME – Non-Thesis Option (Plan II): 30 Credit Hours:

- The non-thesis option is intended primarily for students who are employed full-time in government or industry. Graduates complete 30 hours of graduate course work and pass a comprehensive exam. Credit for ME 599 may not be used to satisfy hour requirements for this degree or The University's 75% rule.
- A student's curriculum must be approved by the student's graduate advisory committee.
- A minimum of 18 semester hours in the major area at or above the 500 level is required. Major area courses are ME and ME cross-listed courses. Six hours of approved coursework in a closely allied area may be used as a major area course.
- A minimum of 6 hours of mathematics is required. Appendix B provides a listing of suggested mathematics courses.
- No more than 6 hours may be at the 400 level. Note that the UA graduate handbook describes important restrictions and requirements regarding use of 400 level hours for a graduate degree.
- The student must pass a comprehensive exam, typically taken during the final semester of study.

Grades below a "C" are counted in the scholastic averages but do not carry credit toward a degree. The grades of at least 75% of all courses must be A or B.

Dual MSME/MBA Program

Students interested in the Dual MSME/MBA Program must apply to each degree program separately and the application is reviewed for admission separately. When filling out the online application for Graduate School, indicate that your program/department is mechanical engineering. For the specialty area, indicate that your specialty will be "MBA Dual Program." Once your ME application is complete, return to the online application website. Now enter through the "Currently or Previously Enrolled UA Grad Student or Applicant to Dual Degree Program." The reason for following this procedure is to ensure you are not charged two application fees. Once this is done, complete the MBA application. For the MBA, you will need to supply scores for the GRE or the GMAT. When prompted for the specialty input box, enter "MSME Dual Program." The MBA program has an additional supplemental application. There is a box to check the dual MSME/MBA program.

Please contact the Mechanical Engineering Department for more information on the Dual MSME/MBA Program.

B. Committees

Every MSME candidate (Plan I or II) is responsible for working with his advisor to select a faculty committee to oversee the candidate's progress toward earning the MSME degree. A committee form must be completed and submitted to the ME Office. The MSME Plan I committee form can be found on-line at the Graduate School web page:

<http://graduate.ua.edu/academics/forms/index.html>

The MSME Plan II form is available in the ME Office.

The MSME Plan I candidate's committee will consist of two members of the department's faculty plus one faculty member from outside the department. The MSME Plan I committee will work with the advisor to approve the candidate's plan of study, to evaluate the candidate's thesis and thesis defense, and to help the candidate with any problems that may arise in the course of obtaining the MSME degree.

The MSME Plan II candidate's committee will consist of three department faculty who have each taught the candidate at least one graduate course. The MSME Plan II candidate's committee is responsible for administering a comprehensive exam, as described in section D.

C. Transfer Credit

With your committee's approval, you may transfer up to one half of your required semester hour credits (12 hours for MSME Plan I and 16 hours for MSME Plan II) from another regionally accredited University. Forms for transfer of credit can be obtained from the UA Graduate School:

http://graduate.ua.edu/academics/forms/tx_grad_credit.pdf

The Mechanical Engineering Department and the Dean of the Graduate School must approve any transfer credit. It is recommended that you discuss potential transfer courses with your major advisor and the ME Graduate Program Coordinator before you apply to The University of Alabama. Only grades of B or better will transfer. In addition, you must have an overall GPA of at least 3.0 on a 4.0 scale at the institution from which the credit will be transferred. Note that the graduate school has very strict deadlines regarding the transfer of credit that differ from graduation application deadlines. These deadlines are posted on the graduate school web site.

D. Comprehensive Examination

A final comprehensive examination is required of all Master's candidates. The content of this exam depends on the candidate's degree program.

Plan I Master's candidates submit a thesis of their research work to the committee members and defend their thesis work in a formal presentation.

Plan II Master's candidates can satisfy the comprehensive exam via one of the following:

- Pass an oral and/or written examination based on course content in the major (and minor) field. The format of the plan II candidate's exam is determined by the committee.
- Pass a formal defense of a journal paper in which the student is an author. The student must meet with the committee to defend their portion of the work described in the paper. The specific format of this exam is at the discretion of the committee.
- Pass a Dissertation Research Proposal as described in Section V.F below. This option is intended for Direct Admit Ph.D. students desiring to obtain a Master's Degree after completing 30 hours of appropriate coursework.

The examination must be passed and the results filed with the Graduate School on the Master's Examination Form no later than six weeks prior to the end of the semester in which degree requirements are to be completed. These deadlines are posted on the graduate school web site.

E. Thesis

The thesis is a formal research document and must be prepared following the Graduate School's thesis guidelines (<http://graduate.ua.edu/etd/manual/>). Your thesis will be reviewed by your thesis advisor and your committee. Once they are satisfied with the thesis, you and your thesis advisor will schedule your Comprehensive Exam/Thesis Defense. After successfully defending your thesis, you may have final corrections and revisions to your thesis before the committee gives their final approval. Such conditions should be considered in scheduling the presentation/defense relative to the graduate school submission deadlines.

The University has adopted a policy whereby students now submit their approved thesis electronically. Details regarding the process for the electronic submission of theses may be found at:

<http://graduate.ua.edu/etd/index.html>

“A Student Guide to Preparing Electronic Theses and Dissertations” may be found at:

<http://graduate.ua.edu/etd/manual/>

F. Necessary Paperwork

A series of forms, obtainable from the Graduate School website, must be filed with the ME department and the Graduate School prior to graduation. These forms may be found at:

<http://graduate.ua.edu/academics/forms/index.html>

The forms must adhere to the UA Graduate School deadlines. UA Graduate School deadlines may be found at:

<http://graduate.ua.edu/calendar/index.html>

After you have completed your first 12 hours of course work, the following forms should be completed and submitted. These forms must be on file prior to the semester in which you plan to receive your degree.

- Outline of Master's Program
- Application for Admission to Candidacy for the Master's Degree
- Appointment/Change of Master's Thesis Committee

At the end of the semester immediately prior to the graduation semester, you should complete and submit the Application for Degree. The deadline for degree applications is early during the semester in which you plan to graduate. Please refer to the aforementioned web site for the UA Graduate School deadlines. It is a good idea to have the Application for Degree form complete at the beginning of the semester in which you plan to graduate.

During the semester of your intended graduation, the following forms should be completed and submitted:

- Master's Exam Form
- Committee Acceptance Form for Electronic Thesis or Dissertation

Note that while the administrative staff in the ME Department may be consulted for assistance regarding these forms, it is the responsibility of each student to complete and submit his/her forms in a timely manner. Failure to submit this paperwork in an appropriate manner may result in a delay of graduation.

G. Time Limits

All requirements for the MSME degree must be completed during the six years prior to the date that the degree is awarded.

V. **REQUIREMENTS FOR THE PhD DEGREE**

A. Degree Requirements

The doctorate requires 48 credit hours of coursework past the Bachelor's degree, a comprehensive qualifying exam and a dissertation. Students with a Master's degree will receive credit for 24 hours of course work. The dissertation must sufficiently document original research that makes a significant contribution to the profession. Doctoral students must spend two consecutive semesters, possibly including a summer, in residence as full-time students engaged in coursework. Note that additional requirements may be stipulated by the UA Graduate School.

Requirements:

- A minimum of 48 semester hours of approved course work that satisfy all other course requirements for the degree. Up to 24 semester hours of course work earned for the Master's degree may be incorporated within the total Ph.D. course work requirement.
- A minimum of 24 semester hours of approved course work in mechanical engineering, of which 9 hours may be in approved closely related supporting fields.
- A minimum of 12 semester hours in any minor technical area must be included in the student's program of study.
- Qualifying examination covering graduate course work must be passed.
- A minimum of 24 semester hours of dissertation research (ME 699) and an approved dissertation.
- A dissertation reviewed and approved by the committee members. The candidate will defend his dissertation in a formal manner for this committee.

Grades below a "C" are counted in the scholastic averages but do not carry credit toward a degree. The grades of at least 75% of all courses must be A or B. The courses counted to arrive at this percentage can include 6 hours of ME 699.

B. Committees

Every PhD candidate is responsible for working with his advisor to select a committee of five or more members. The candidate's committee will consist of the advisor plus at least three members of the department's faculty plus at least one faculty member from outside

the department. The committee will work with the advisor to approve the candidate's plan of study, to evaluate the candidate's dissertation and plan the dissertation defense, as well as to help the candidate with any problems that may arise in the course of obtaining the PhD degree.

C. Transfer Credit

With your committee's approval, you may transfer up to one half of your required semester hour credits (24 hours) from another regionally accredited university. Forms for transfer of credit can be obtained from the UA Graduate School. The Mechanical Engineering Department and the Dean of the Graduate School must approve any transfer credit. It is recommended that you discuss potential transfer courses with your major advisor and the ME graduate coordinator before you apply to the University of Alabama. Only grades of B or better will transfer. In addition, you must have an overall GPA of at least 3.0/4.0 at the institution from which the credit will be transferred.

For applicants holding an MS degree not earned during the previous six years, the student must demonstrate field-relevant employment in order to earn the 24 hours of transfer credit for that MS degree. Additional information is available in the Graduate School Catalog (http://services.graduate.ua.edu/catalog/14800.html#transfercredit_phd). Note that the graduate school has very strict deadlines regarding the transfer of credit that differ from graduation application deadlines. These deadlines are posted on the graduate school web site.

D. Plan of Study

Soon after admission to the PhD program, you should work with your advisor and committee to complete the Outline of Doctoral Program for the PhD. Consult the graduate course schedule for help with choosing the coursework that will be listed in this 3-year plan of study. Courses listed in the plan of study may be modified during your course of study with the approval of your advisor. *It is the student's responsibility to keep the graduate school informed of revisions to the Plan of Study, as this document is used to audit the student's courses prior to graduation.*

E. Residence Requirements

PhD students must spend an academic year in continuous residence on the campus of The University of Alabama as a full-time student in the Graduate School. If specifically approved, one full summer consisting of two terms, preceded or followed by a regular semester, may satisfy residency. This requirement can be satisfied only by enrolling in coursework; dissertation or thesis research cannot be used.

F. Dissertation Research Proposal

The Ph.D. degree is a research degree whose defining elements are the dissertation research and dissertation. A formal written dissertation research proposal is an important part of the Comprehensive Qualifying Examination discussed in section G.

G. Comprehensive Qualifying Examination

A comprehensive qualifying examination is required of all students enrolled in the doctoral program for earning PhD candidacy. This examination is given after approximately two full years of graduate study are completed. The examination consists of the following:

- A written dissertation research proposal consisting of two parts. The first part will describe the research objective and research already completed toward that objective. The second part will outline research proposed to be undertaken to complete the dissertation.
- An oral examination defending the dissertation proposal.
- In addition, an examination, oral or written, based on graduate coursework can be assigned at the discretion of the graduate committee. In many cases, however, the proposal oral presentation satisfies this requirement.

The comprehensive qualifying examination must be completed at least nine months before the degree is to be awarded. If the student's qualifying examination results are deemed unacceptable by the student's committee, the student may arrange to retake the exam a maximum of one more time.

H. Candidacy and Continuous Registration

A student who has successfully completed the qualifying examinations and has had his or her dissertation research proposal approved will be admitted to *candidacy* for the doctoral degree. Students admitted to candidacy are expected to pursue completion of the dissertation without interruption by enrolling each semester following admission to candidacy for at least three hours of dissertation research.

I. Dissertation and Final Examination

The dissertation research and dissertation are the defining elements of the PhD degree. The dissertation must demonstrate independent, original scholarship within the mechanical engineering field.

The dissertation is a formal research document and must be prepared following the Graduate Schools guidelines (<http://graduate.ua.edu/etd/manual/>). Your dissertation will be reviewed by your advisor and your dissertation committee. Your advisor will help in

scheduling your Final Exam/Dissertation Defense. After a successful defense, you may still have final dissertation corrections and revisions required by the committee. Such conditions should be considered in scheduling the presentation/defense relative to the graduate school submission deadlines.

The University has adopted a policy whereby students now submit their approved dissertation electronically. Details regarding the process for the electronic submission of dissertations may be found at:

<http://graduate.ua.edu/etd/index.html>

“A Student Guide to Preparing Electronic Theses and Dissertations” may be found at:

<http://graduate.ua.edu/etd/manual/>

The [article-style dissertation](#) can be used as an alternate to the traditional dissertation format. This format is beneficial for publication of the dissertation research. Additional information concerning the article-style dissertation may be found at:

http://graduate.ua.edu/etd/manual/prep.html#article_style

J. Necessary Paper Work

A series of forms, obtainable from the Graduate School website, must be filed with the ME department and the Graduate School prior to graduation. These forms include:

- Appointment/Change of Doctoral Dissertation Committee
- Outline of Doctoral Program for the PhD
- Admission to Candidacy for the PhD
- Doctoral Qualifying Exam Form
- Application for Degree
- Doctoral Final Defense Form
- Committee Acceptance Form for Electronic Dissertation
- Survey of Earned Doctorates – submission through NORC website

and may be found at:

<http://graduate.ua.edu/academics/forms/index.html>

The forms must adhere to the UA Graduate School deadlines. UA Graduate School deadlines may be found at:

<http://graduate.ua.edu/calendar/index.html>

Note that while the administrative staff in the ME Department may be consulted for assistance regarding these forms, *it is the responsibility of each student to complete and submit his/her forms in a timely manner.* Failure to submit this paperwork in an appropriate manner may result in a delay of graduation.

K. Time Limits

All requirements for the Ph.D. degree must be completed during the seven years immediately prior the date that the degree is awarded.

APPENDICES

A. Undergraduate Course Requirements for Non-ME Graduates

Students who hold Bachelor of Science degrees in a discipline other than Mechanical Engineering are encouraged to consider a graduate degree in ME. The following prerequisite undergraduate courses or acceptable equivalents are required

1. Mathematics: Calculus (usually 12 semester credit hours) and Ordinary Differential Equations
2. Chemistry: General Chemistry (usually 4 semester credit hours)
3. Physics: Calculus Based Physics (usually 8 semester credit hours)
4. Mechanical Engineering, depending on your emphasis area in graduate school
 - a. Thermal-Fluids Emphasis:
ME 215 (3 hours) Thermodynamics
AEM 311 (3 hours) Fluid Mechanics
ME 309 (3 hours) Heat Transfer
 - or
 - b. Mechanical Systems Emphasis
AEM 250 (3 hours) Mechanics of Materials I
ME 350 (3 hours) Static Machine Components
ME 372 (3 hours) Dynamic Systems

The engineering courses listed above may have prerequisite courses as listed in the University Catalog. Students with Bachelor of Science degrees in physical sciences are likely to have the background to start directly in the listed Mechanical Engineering courses.

B. Guide for Math Courses for Master's Students

The following list is composed for your guidance. Courses listed here are pre-approved to satisfy the 6 hours of mathematics requirement for the Mechanical Engineering Master's programs. Other courses may be approved on an individual basis by the student's graduate committee.

Engineering: The following engineering courses are pre-approved to fulfill the ME Master's math requirement.

ME 501 Mechanical Engineering Analysis I. (3-0) Three hours. Prerequisites: ME 309, ME 349, and ME 372. Analysis of mechanical engineering systems; presentations and application of advanced analysis techniques for continuous and discrete dynamic systems.

ME 530 Fuzzy Set Theory and its Applications. (3-0) Three hours.

Prerequisites: GES 255 or ME 349 or Instructor Consent. The course covers the basic concepts in fuzzy set theory, fuzzy logic, and approximate reasoning. Relation between fuzzy set theory, probability theory, and possibility theory is also discussed. Applications of fuzzy set theory in engineering systems through the use of Matlab's *Fuzzy Toolbox* are outlined.

GES 500 Engineering Statistics. (3-0) Three hours. Prerequisite: MATH 126.

Not open to students who have earned credit for GES 255 or GES 400; not available for M.S.I.E. or M.S.C.S. degree credit. Probability and basic statistical concepts. Discrete and continuous distributions; the central limit theorem; sampling distributions; point and interval estimation; hypothesis testing; regression and correlation analysis; analysis of variance.

GES 501 Operations Research. (3-0) Three hours. Prerequisite: MATH 126.

Corequisite: GES 255, GES 400, or GES 500. Not open to students who have earned credit for IE 363; not available for M.S.I.E. degree credit. Model construction, linear programming, network models, dynamic models, stochastic models, queueing theory, and decision theory.

GES 551 Matrix and Vector Analysis. (3-0) Three hours. Prerequisite: MATH 253 or permission of the instructor. This course provides a graduate level overview of linear algebra and vector analysis. Topics covered include; linear simultaneous equations, eigenvalues and eigenvectors, matrix functions, computer techniques, and transformations, vector calculus, the Laplacian, and integral theorems such as the theorems of Green and Stokes.

GES 554 Partial Differential Equations. (3-0) Three hours. This course examines the solution of partial differential equations by focusing on three specific equations: (1) the heat equation, (2) the wave equation, and (3) Laplace's equation. Topics covered include: Fourier transforms, Sturm-Louisville problems, classification of partial differential equations, Bessel functions, and numerical methods for solving partial differential equations.

GES 658 Applied Numerical Methods. (3-0) Three hours. Prerequisites: GES 451 and MATH 238. Condensed coverage of numerical methods essential in engineering: interpolation, integration, root calculation, matrix algebra, eigenvalue problems, matrix differential equations, two-point boundary value problems, least square approximation, Fast Fourier Transforms, and optimization methods. Emphasis is on applications with extensive FORTRAN programming.

Mathematics: Any 500- or 600- level course taught by the mathematics department (MATH prefix) will satisfy the ME Master's math requirement. The following courses are the ones that an ME would usually find of interest.

MATH 500 Mathematical Methods of Physics I. Three hours. Prerequisite: MATH 238. Vector calculus, tensors and matrices, functions of a complex variable, and special functions.

MATH 501 Mathematical Methods of Physics II. Three hours. Prerequisite: MATH 500. Special functions, Fourier series and integral transforms, Green's functions, and group theory.

MATH 510 Numerical Linear Algebra. Three hours. Prerequisites: MATH 237 (or MATH 257) or equivalent. Direct solution of linear algebraic systems, analysis of errors in numerical methods for solutions of linear systems, linear least-squares problems, orthogonal and unitary transformations, eigenvalues and eigenvectors, and singular value decomposition.

MATH 511 Numerical Analysis I. Three hours. Prerequisites: MATH 237, MATH 238 or MATH 257, and CS 226; or equivalent. Numerical methods for solving nonlinear equations; iterative methods for solving linear systems of equations; approximations and interpolations; numerical differentiation and integration; and numerical methods for solving initial-value problems for ordinary differential equations.

MATH 512 Numerical Analysis II. Three hours. Prerequisite: MATH 411, MATH 511, or equivalent. Continuation of MATH 511 with emphasis on numerical methods for solving partial differential equations. Also covers least-squares problems, Rayleigh-Ritz method, and numerical methods for boundary-value problems.

MATH 520 Linear Optimization. Three hours. Prerequisite: MATH 237. Topics include formulation of linear programs, simplex methods and duality, sensitivity analysis, transportation and networks, and various geometric concepts.