Graduate Handbook

For

Master’s & Ph.D. Students

UAHuntsville

Mechanical & Aerospace
Technology Hall N274
Huntsville, AL  35899
256-824-6154

Chemical & Materials
Engineering Building 130
Huntsville, AL  35899
256-824-6810

Rev. (4/2012)
MESSAGE FROM THE GRADUATE FACULTY

Dear Graduate Student:

Welcome to the Department of Mechanical & Aerospace Engineering at The University of Alabama in Huntsville. We are delighted that you have elected to further your engineering education at UAHuntsville. We hope that your experience with us will be fulfilling, rewarding, and productive. We have an excellent department with a range of opportunities for you to explore. The range of research interests of our faculty is quite broad, affording our graduate students opportunities for advanced work in the major areas of fluid and solid mechanics, heat transfer, aerodynamics, thermodynamics, transport phenomena, computational fluid dynamics, computational structural dynamics, applied optics, experimental mechanics, uncertainty techniques, space plasma, controls, combustion, propulsion, and aerospace systems, among other areas. We encourage you to explore the depth and breadth of the area that best fits your professional ambitions. The MSE and Ph.D. degrees granted by the Department in these areas are equivalent to those available from Mechanical & Aerospace Engineering Programs across the country. Please note that the Ph.D. degree in Chemical Engineering is also administered through the Department of Mechanical & Aerospace Engineering.

We encourage you to seek out the faculty of the Department and learn more about our research activities and areas of specialization. Further, we invite you to see the members of the Graduate Program Committee or the Department Chair whenever you need assistance in your graduate studies. This Handbook is provided to give you more information about the Department, its regulations, and its procedures. This Handbook serves as a supplement to the most current Graduate Catalog of the University. The information contained in this Handbook in no way supersedes the official general rules and regulations of the Department or the School of Graduate Studies.

We look forward to meeting you. We wish you the best in your academic endeavors.

Sincerely,

The Graduate Faculty
Mechanical & Aerospace Engineering
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GRADUATE FACULTY

MECHANICAL & AEROSPACE ENGINEERING FACULTY

JAMES B. BLACKMON, Research Professor, Ph.D. - University of California-Los Angeles. Research interests include propulsion systems, solar power systems, and space hardware development. Office: TH S233, (256) 824-5106. Email: blackmoj@uah.edu

JASON CASSIBRY, Associate Professor, Ph.D. - University of Alabama in Huntsville. Research involves theoretical and experimental studies of plasma acceleration and magnetized target fusion for advanced propulsion concepts and terrestrial power production. Specific topics include pulsed electromagnetic plasma thrusters, MHD modeling, and smoothed particle hydrodynamics. Office: TH S232, (256) 824-5107. Email: Jason.Cassibry@uah.edu

T. J. CHUNG, UA System Distinguished Professor Emeritus, Ph.D. - Oklahoma State University. The author of several books including Computational Fluid Dynamics, Cambridge University Press, 2002. Current research includes turbulence, combustion, acoustics, radiative heat transfer, multiphase flow, relativistic astrophysical flows. Office: TH N272C, (256) 824-6394. Email: tchung@mae.uah.edu


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DONALD B. WALLACE, Professor, P.E., Ph.D. - University of Wisconsin. Research interests include photovoltaic system design, solar energy systems, and computer-aided engineering and design (CAE and CAD). Office: TH N262, (256) 824-6323. Email: wallace@mae.uah.edu

GANG WANG, Assistant Professor, Ph.D. - Ph.D. University of Maryland, College Park. Research interests include: Rotorcraft, Adaptive Structures, Solid Mechanics, and Emerging Technologies. Office: TH N258, (256) 824-6209. Email: Gang.Wang@uah.edu

FRANCIS WESSLING, Professor, P.E. Ph.D. - University of Minnesota. Past research in materials in a microgravity environment, including designing several experiments for flight on the Space Transportation System (Space Shuttle, STS) and on the International Space Station, ISS. Research publications in the areas of heat transfer, rocketry and energy conservation. Office: TH N270, (256) 824-5020. Email: wesslif@uah.edu

S. T. WU, UA System Distinguished Professor Emeritus, Ph.D. - University of Colorado. Research in magnetohydrodynamics, gasdynamics, radiative gasdynamics, plasmadynamics, and computational methods in fluids and heat transfer with applications to understanding various solar phenomena including solar flares, the solar wind and space environment. Research is funded by NASA, DOD, NSF. Office: TH N272B, (256) 824-6413. Email: wus@cspar.uah.edu

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CHEMICAL & MATERIALS ENGINEERING FACULTY

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RAMON L. CERRO, Professor, P.E., Ph.D. - University of California at Davis. Areas of research interest include physicochemical hydrodynamics, heat and mass transfer in multiphase systems, and monomolecular Langmuir-Blodgett ultra thin films (nanotechnology). Research funded by NSF. Office: EB 133, (256) 824-7313. Email: rlc@che.uah.edu

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JAMES E. SMITH, JR., Professor, Ph.D. – University of South Carolina. Areas of research include catalysis, energy conversion, materials processing in space, surface chemistry, advanced furnace design and analysis, fiber optic chemical sensing, and hypergolic bipropellant combustion. Research funded by SMDC and Corporations. Office: EB 138, (256) 824-6439, Email: jesmith@che.uah.edu

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GENERAL INFORMATION

GRADUATE DEGREE PROGRAMS
The range of faculty research interests in the Department of Mechanical & Aerospace Engineering (MAE) is broad. This offers graduate students opportunities for advanced work in areas such as fluid and solid mechanics, heat transfer, acoustics, aerodynamics, thermodynamics, transport phenomena, propulsion, combustion, computational fluid dynamics and mechanics, experimental mechanics, dynamics and controls, and aerospace systems. Interested individuals are encouraged to review the information about faculty research interests, ongoing research projects, program requirements, course availability, funding opportunities, and forms available on the MAE web site at www.uah.edu/mae. Prospective and current students should note that the most current version of the MAE Graduate Handbook is posted on the web site.

The MAE Department offers a variety of programs leading to the Master of Science in Engineering (MSE) degree with an option in Mechanical Engineering and a Master of Science in Aerospace Systems Engineering (MSASE). MAE faculty are well known for their scholarly and research activities. The Department offers a research-oriented program leading to the Doctor of Philosophy (Ph.D.) degree in Mechanical Engineering and a Doctor of Philosophy (Ph.D.) degree in Aerospace Systems Engineering. A Program of Study leading to a Ph.D. degree in Chemical Engineering is also administered by the MAE Department.

GRADUATE PROGRAM COMMITTEE
The Department Chair is responsible for the administration of the MAE Department's graduate program. The Chair is aided by the Graduate Program Committee that has the responsibility of evaluating new applications, recommending graduate students for financial assistantships, and coordinating and supervising graduate exams. Additional responsibilities include the evaluation of graduate regulations, courses, and programs of study.

FINANCIAL AID AND ASSISTANTSHIPS
The MAE Department has at its disposal a number of appointments for teaching assistants and research assistants supported by department funds.

Teaching Assistants (TA) are appointed and supervised by the Department Chair. They normally aid professors in large courses by handling laboratory and discussion sections, and grading papers.

Research Assistants (RA) are appointed by the individual department professors to help them in their specific research activities. Their continued appointment from one semester to the next is dependent on the availability of research funds.

All appointments include a stipend, tuition and a modest health insurance policy. Graduate student assistants are expected to perform 20 hours of work per week. Any deviation from this rule must be approved by the Department Chair.
Students holding a teaching or research assistantship must register for at least nine (9) credit hours in each Fall and Spring semester and six (6) credit hours in each Summer semester. Graduate assistants must also register for ten (10) credit hours during the semester they enroll in Graduate Seminar (MAE 683 or 684).

The Graduate Program Committee continuously reviews the record and progress of every graduate student. All teaching and research appointments are conditional on satisfactory academic and teaching/research performance.

APPLICATION PROCEDURE
An applicant for the Master of Science in Engineering (MSE or MSASE) or Doctor of Philosophy (Ph.D.) degree programs must submit a completed graduate application form (see FORMS) and a nonrefundable application fee to the Office of Graduate Admissions. The general application directions are provided in the UAHuntsville Graduate Catalog. Applicants for degree admission must submit complete transcripts from all colleges and universities attended. Applicants for non-degree admission must provide proof of a bachelor’s degree from an accredited institution and obtain department approval.

The Graduate Record Exam (GRE) is required for all applicants to the MSE, MSASE and direct BSE to PhD degree programs. However, this requirement may be waived by the Graduate Dean upon recommendation of the Department Chair if the applicant holds a post-baccalaureate degree from an accredited institution. In addition to the GRE, international students are required to take the TOEFL exam. Required GRE scores are described in the ADMISSION REQUIREMENTS section. Minimum scores for the TOEFL exam are provided in the UAH Graduate Catalog.

After initial review for admission by Graduate Studies, applications are forwarded to the MAE Department. Each applicant will be asked to fill out the MAE Graduate Student Information form (see FORMS) and electronically return it to the MAE Department. This form will be used for an admission decision, initial advisor assignment and consideration for an assistantship.

To assure adequate time for review, applications should be received by June 15 for Fall semester admission, October 15 for the Spring semester, and March 15 for the Summer semester. Applications submitted after this date may not be processed in time for admission in the following semester. Applicants desiring a teaching or research assistantship are especially encouraged to submit before these dates.

ADMISSION REQUIREMENTS
The Department reviews each individual applicant based on multiple factors including, but not limited to: grades, grade point average, prior academic experience, references, independent and supervised research, and test scores. All decisions reflect these cumulative and multifaceted criteria and no one factor is determinative. Minimal GPA and test scores do not guarantee admission since applicants are judged on their overall qualifications.

For unconditional admission to the MSE and MSASE degree programs, applicants must have an engineering baccalaureate from an accredited college or university, a grade point average of at
least 3.00 (where A = 4.00) for the final 60 semester hours of undergraduate study, and may submit up to three letters of recommendation. GRE tests scores required for unconditional admission are as follows:

(a) For GRE tests administered before August 2011
   - Minimum total score of 1100 on the verbal plus quantitative portions;
   - Minimum of 700 on the quantitative portion; and
   - Minimum score of 3.0 on the analytical writing portion.

(b) For GRE tests administered in August 2011 or later
   - Minimum total score of 300 on the verbal plus quantitative portions;
   - Minimum of 155 on the quantitative portion; and
   - Minimum score of 3.0 on the analytical writing portion.

In exceptional cases, applicants with grade point averages below 3.00 and/or GRE scores below the minimum may be admitted on conditional standing if they show evidence of substantial ability to successfully complete their degree program. See the UAHuntsville Graduate Catalog for the policies on conditional admission.

Applicants with outstanding records in fields other than mechanical or aerospace engineering, or from a non-accredited engineering program will be considered for conditional admission, and must remedy deficiencies in their preparation after the start of their academic program. This remedy may include taking prerequisite undergraduate MAE courses as described in PROGRAM OF STUDY REQUIREMENTS FOR STUDENTS WITHOUT A BS DEGREE IN MECHANICAL OR AEROSPACE ENGINEERING. After satisfying these requirements a student may then be granted unconditional standing in the graduate program.

The MAE Ph.D. ME and ASE degrees are research-oriented and applicants are evaluated on the basis of their overall records. A minimum graduate grade point average of 3.25 is required for unconditional admission. Applicants with grade point averages below 3.25 may be admitted on conditional standing if they show evidence of substantial ability to successfully complete their degree program and with the endorsement of a MAE department faculty member.

Additional details related to Provisional and Non-degree admission are provided in the UAHuntsville Graduate Catalog. All decisions regarding admission to graduate study in a degree program are discretionary and are determined solely by the MAE Graduate Program Committee and Department Chair with the approval of the Dean of the School of Graduate Studies.

TRANSFER CREDIT
The policies governing transfer of course credits are described in the section on MSE Degree Requirements and Ph.D. Degree requirements. Graduate students who wish to transfer course credits earned at other universities or to request a waiver of some of the degree requirements should contact the MAE Department Chair, the Graduate Program Committee, or his/her advisor immediately upon arrival at UAHuntsville for early appropriate action.
ADVISING
Upon admission to the graduate program, a student is assigned a temporary faculty advisor by the Department Chair. This assignment is made on the basis of the student's intended fields of concentration or special interests. The temporary advisor will assist the student during the first two terms of registration and acquaint the student with the various rules, regulations and procedures of the Department. A MSE student is required to select a permanent advisor no later than the end of the semester in which he/she will have accumulated 12 credit hours. A Ph.D. student must select a permanent advisor immediately after admission. The permanent advisor must establish a Supervisory Committee to review the student's program of study as early as possible but no later than the student’s Preliminary Exam. If their research interests so dictate, a student in the MAE Department may select an advisor from the Chemical Engineering Department.

MAE faculty members are available to meet all graduate students and discuss their research interests. However, an advisor may indicate at any time that he/she no longer wishes to retain the student under his/her supervision. Should the advisor decide not to retain the student, the advisor must inform the student and the Department Chair in writing. Should the student desire to end the association, the student must similarly inform the advisor and the Department Chair. If the student is in good standing, the Graduate Program Committee in consultation with the Department Chair will assist the student in selection of a new advisor. Students on teaching or research assistantships may be required to continue under their current advisor until the end of a semester.

CONTINUATION
Students may continue to register as long as they remain in good standing, here defined as satisfactory progress and achievement, and meet the code of conduct described in the Student Handbook. The Graduate School specifies that a student must maintain a cumulative grade point average of at least 3.0 on all work taken at UAHuntsville as a graduate student.

REPETITION OF COURSES
A student is permitted to repeat a course for credit in the following two situations:
(1) The course is designated in the UAHuntsville semester schedule or catalog with the phrase "May be repeated for credit"; or
(2) A grade of C or lower was received in the course.

In the latter case, the course may be repeated only once and may be counted only once toward the degree requirements. The original grade will continue to be included in the computation of the student’s grade point average. Approval of both the instructor of the course and the Department Chair is required for course repetition.

GRADUATE SEMINAR POLICY
All MSE, MSASE and Ph.D. program students are required to take MAE 683, Graduate Seminar, or MAE 684, Aerospace Systems Seminar. The Graduate Catalog course descriptions are as follows:
**MAE 683 Graduate Seminar**  
(1 hr)  
Professional activities designed to promote the skills required to organize and deliver oral technical presentations and to broaden the individual's awareness of technical issues. Students will be graded “S” (satisfactory) or “U” (unsatisfactory) based upon their performance and attendance. Students who do not receive an “S” grade must register for the course until an “S” is obtained.

**MAE 684 – Aerospace Systems Seminar**  
(1 hr)  
Seminar course for students in the MS and Ph.D. programs in Aerospace Systems Engineering designed to promote the skills required to organize and deliver oral technical presentations and to broaden the individual’s awareness of technical issues. Students will be graded “S” (satisfactory) or “U” (unsatisfactory) based upon their performance and attendance. Students who do not receive an “S” grade must register for the course until an “S” is obtained.

The purpose of the seminar courses is primarily to provide opportunities for students to prepare and practice making presentations. The topic for the presentation may be selected by the student but it shall be technical in nature; preferably, related to: (1) thesis/dissertation research; or (2) other work related activities. Satisfactory completion of the Graduate Seminar requires the student to make an acceptable presentation and fulfill all other attendance and course requirements.

To enroll in MAE 683 or MAE 684, Plan I MSE or MSASE students and Ph.D. candidates must have completed or be concurrently enrolled in MAE 699 or MAE 799, respectively. Plan II (Non-thesis) MSE or MSASE students must have completed 24 hours of graduate course work or be in their last semester of study in the MSE or MSASE program.

**PROGRAM OF STUDY REQUIREMENTS FOR STUDENTS WITHOUT A BS DEGREE IN MECHANICAL OR AEROSPACE ENGINEERING**

All students who are admitted to the MAE MSE, MSASE or Ph.D. programs must first contact the Department Chairman or chair of the Graduate Program Committee for assignment of a temporary advisor prior to registration. Students with a BS or BA degree in disciplines other than Mechanical or Aerospace Engineering may be admitted to the MAE MSE, MSASE or Ph.D. programs if the student:

1. Is judged by the Graduate Program Committee to be capable of pursuing MAE graduate courses with grades of B or above, **AND EITHER**

2. Takes a total of 30 semester hours of MAE undergraduate courses from the following list:

   - MAE 272  
     Dynamics
   - MAE 310  
     Fluid Dynamics I
   - MAE 341  
     Thermodynamics I
   - MAE 342  
     Thermodynamics II
   - MAE 364  
     Kinematics and Dynamics of Machines
   - MAE 370  
     Mechanics of Materials
MAE 385  Numerical Methods and Engineering Computations
MAE 410  Fluid Dynamics II
MAE 420  Compressible Aerodynamics
MAE 450  Heat & Mass Transfer
MAE 488  Analysis of Engineering Systems

OR

(3) Submits a proposal, in consultation with his/her advisor, to the Graduate Program Committee for waiver of one or more, or all courses listed in item (2) above. This proposal must be accompanied by well-documented justifications. A proposed graduate Program of Study (see FORMS) should accompany the proposal. Consideration will be given to the student’s chosen areas of interest, work experience, and previous educational record. The Graduate Program Committee will determine the acceptability of this proposal. Approval requires a majority vote of the Committee.

Documentation listing undergraduate course work requirements approved by the advisor, Graduate Program Committee, and the Department Chair must be included in the student’s permanent file.
MASTER OF SCIENCE DEGREE REQUIREMENTS

The MAE Department offers two MS degrees: Master of Science in Engineering (MSE) with a concentration in Mechanical Engineering and Master of Science in Aerospace Systems Engineering (MSASE). Requirements for these two degree programs are described in the following sections.

I. Master of Science in Engineering (MSE)
There are two MSE options designated Plan I (Thesis) and Plan II (Non-thesis). The requirements for these options are summarized in Table 1 with the basic and specific requirements described in the following sections.

Table 1 – MSE Program Option Requirements

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<th>Option</th>
<th>Course Hours</th>
<th>Research Hours</th>
<th>Other</th>
<th>Exam</th>
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<tr>
<td>Plan I, Thesis</td>
<td>24, including MAE 692 and 671</td>
<td>9 hrs of MAE 699</td>
<td>MAE 683 (1 hr)</td>
<td>Thesis Defense</td>
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<td>(34 hrs)</td>
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<tr>
<td>Plan II, Non-thesis</td>
<td>33, including MAE 692 and 671</td>
<td>-----</td>
<td>MAE 683 (1 hr)</td>
<td>Comprehensive Exam: Technical presentation in MAE 683*</td>
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<td>(34 hrs)</td>
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*See GRADUATE SEMINAR POLICY

BASIC MSE PROGRAM OF STUDY
The Basic Program of Study, common to both the Plan I and Plan II (Non-thesis) MSE options contains a minimum of 24 hours of graduate-level course work that must include:
(a) An engineering major consisting of 12 hours of graduate courses including supporting engineering courses;
(b) A first minor of 6 hours of graduate courses in an approved engineering area of specialization; and
(c) A second 6 hour minor consisting of MAE 692 and an additional 3 hour graduate course in Mathematics or Graduate Engineering Analysis. The required MAE 671 course may be used to fulfill this additional 3 hours.

With prior approval, up to 12 hours of 500 level courses may be taken in fulfillment of the Basic and Specific program requirements.
SPECIFIC MSE PROGRAM REQUIREMENTS

Plan I, Thesis Option (34 hours). Students selecting this option must:
(a) Successfully complete an approved Basic Program of Study consisting of 24 course hours including MAE 692 and MAE 671;
(b) Successfully complete at least 9 semester hours of MAE 699 – Master’s Thesis;
(c) Successfully complete the 1 hour MAE 683 - Graduate Seminar (see GRADUATE SEMINAR POLICY);
(d) Complete an acceptable thesis and pass the final examination consisting of a public thesis defense; and
(e) Submit a journal manuscript to their research advisor (see JOURNAL SUBMITTAL).

Plan II, Non-thesis Option (34 hours). Students selecting this option must:
(a) Successfully complete an approved Basic Program of Study consisting of 24 course hours including MAE 692 and MAE 671;
(b) Successfully complete an approved extended program of study consisting of an additional 9 hours of graduate courses; and
(c) Successfully complete the 1 hour MAE 683 - Graduate Seminar. This includes an oral technical presentation which constitutes the Comprehensive Exam (see GRADUATE SEMINAR POLICY).

II. Master of Science in Aerospace Systems Engineering (MSASE)
There are two MSASE options designated Plan I (Thesis) and Plan II (Non-thesis). The requirements for these options are summarized in Table 2 with the basic and specific requirements described in the following sections.

<table>
<thead>
<tr>
<th>Option</th>
<th>Course Hours</th>
<th>Research Hours</th>
<th>Other</th>
<th>Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan I, Thesis (34 hrs)</td>
<td>24, including MAE 692, ISE 601 and ISE 627</td>
<td>9 hrs of MAE 699</td>
<td>MAE 684 (1 hr)</td>
<td>Thesis Defense</td>
</tr>
<tr>
<td>Plan II, Non-thesis (34 hrs)</td>
<td>33, including MAE 692, ISE 601 and ISE 627</td>
<td>-----</td>
<td>MAE 684 (1 hr)</td>
<td>Comprehensive Exam: Technical presentation in MAE 684*</td>
</tr>
</tbody>
</table>

*See GRADUATE SEMINAR POLICY
BASIC MSASE PROGRAM OF STUDY
The Basic Program of Study, common to both the Plan I and Plan II (Non-thesis) MSASE options, contains a minimum of 24 hours of graduate level course work that must include:

(a) An engineering major consisting of 12 hours of graduate courses including supporting engineering courses;
(b) A first minor of 6 hours of graduate courses including ISE 627 and another 3 hour course in an approved engineering area of specialization; and
(c) A second minor of 6 hours of mathematics consisting of MAE 692 and ISE 601. Students that have taken ISE 390 or equivalent can substitute ISE 690 with ISEEM Department approval.

With prior approval, up to 12 hours of 500 level courses may be taken in fulfillment of the Basic and Specific program requirements.

SPECIFIC MSASE PROGRAM REQUIREMENTS

Plan I, Thesis Option (34 hours). Students selecting this option must:
(a) Successfully complete an approved Basic Program of Study consisting of 24 course hours including MAE 692, ISE 601 and ISE 627;
(b) Successfully complete at least 9 semester hours of MAE 699 – Master’s Thesis;
(c) Successfully complete the 1 hour MAE 684 - Aerospace Systems Seminar (see GRADUATE SEMINAR POLICY);
(d) Complete an acceptable thesis and pass the final examination consisting of a public thesis defense; and
(e) Submit a journal manuscript to their research advisor (see JOURNAL SUBMITTAL).

Plan II, Non-thesis Option (34 hours). Students selecting this option must:
(a) Successfully complete an approved Basic Program of Study consisting of 24 course hours including MAE 692, ISE 601 and ISE 627;
(b) Successfully complete an approved extended program of study consisting of an additional 9 hours of graduate courses; and
(c) Successfully complete the 1 hour MAE 684 - Aerospace Systems Seminar. This includes an oral technical presentation which constitutes the Comprehensive Exam (see GRADUATE SEMINAR POLICY).

GRADE REQUIREMENTS
All MSE and MSASE students must maintain satisfactory academic standing to continue their degree program. Satisfactory standing includes the following:
(1) Average grade on the courses numbered 600 and above cannot be less than B; and
(2) A minimum grade of B must be attained in each engineering course in the student’s Program of Study designated by a number less than 600. If a lower grade is attained, a substitution of another approved course is required.
(3) Engineering courses numbered between 500-599 may be taken for graduate credit with prior approval of such courses on the student's Program of Study. Graduate students may be required to do extra work of appropriate nature in 500-level courses.
(4.) The number of 500 level course credit hours shall not exceed twelve (12).

TRANSFER CREDIT
With permission of the Graduate Program Committee and the Department Chair, a student may transfer a maximum of 6 semester hours of acceptable graduate credit earned in an approved institution and may count it toward a MSE or MSASE degree. The student may also petition the MAE Department to recommend to the Graduate Dean that 6 additional hours of graduate credit be accepted. Such credit may not be more than ten years old at the time of the student's graduation from UAHuntsville. The credit is transferable only if the student (1) was enrolled in a graduate school at the time the courses were taken, and (2) had an overall average of B or better in graduate coursework at that institution.

Students who have graduate credit from another campus of the University of Alabama System must complete a minimum of 12 semester hours of acceptable graduate credit at UAHuntsville to receive an MSE or MSASE degree from UAHuntsville. Additional rules governing transfer of credit are contained in the UAHuntsville Graduate Catalog.

THESIS
The thesis should show evidence of the student’s capability for research, independent thought, and analysis. Furthermore, the thesis should be written in fluent, acceptable English. The subject must be in the major field. All theses must be accessible to the general public. The thesis is supervised and approved by a faculty Supervisory Committee composed of at least three members of the graduate faculty and appointed by the Department Chair with approval of the Graduate Dean. Students working on a thesis must register for thesis credit (MAE 699) each term in which they receive supervision or during which they are in engaged in the formal preparation and/or defense of the thesis.

A completed copy of the thesis must be submitted to the MAE Department at least eight weeks before the end of the semester in which degree requirements are expected to be completed. Detailed procedures for submission of theses can be found at [http://www.uah.edu/graduate](http://www.uah.edu/graduate). After the student has passed his/her thesis defense and at least five weeks before the end of the semester in which degree requirements are expected to be completed, a copy of the thesis signed by the Supervisory Committee, Department Chair and College Dean must be submitted to the Office of Graduate Studies for final proofreading and approval by the Graduate Dean. Six printed copies and one digital copy of the final approved thesis must be deposited in the Office of Graduate Studies along with applicable forms and fees one week prior to the end of the semester. Theses must comply with the regulations set forth in the Graduate School’s Thesis and Dissertation Manual, available online at [http://www.uah.edu/graduate/resources/thesis-manual](http://www.uah.edu/graduate/resources/thesis-manual).

In exceptional cases, theses may be written in absentia. Before leaving the University, students must:
- Select a thesis subject;
- Submit a satisfactory outline of the thesis to the Department Chair; and
- Submit evidence that adequate facilities are available where the research is to be done.
The student’s advisor, the Department Chair, and the Graduate Dean must approve the absentia plan.

**JOURNAL SUBMITTAL**
Each Plan I MSE and MSASE student is required to derive a manuscript from their thesis for consideration for publication as a technical note or article in an appropriate refereed journal. The specific journal should be chosen in consultation with the advisor and Supervisory Committee. A draft of this manuscript must be submitted to the Supervisory Committee at the oral Final Examination and may be included as an appendix to the thesis. The final revised manuscript must be provided to the student’s advisor when the final thesis manuscript is submitted. The manuscript must be appropriately formatted as specified by the journal editors.

**SUPERVISORY COMMITTEE**
Each Plan I MSE and MSASE student must select a Supervisory Committee consisting of a Committee Chair, and at least two additional members. A majority of the committee must be from the MAE Department. The Chair and at least half of the Committee must:

1. Be full-time UAHuntsville faculty members; and
2. Have full membership in the graduate faculty.

The student’s advisor typically chairs the Committee. The other two members are selected by the advisor in consultation with the student and are subject to approval by the Department Chair and the Graduate Dean. Under the guidance of the advisor, the Plan I student will be allowed to register for thesis credit (MAE 699). The Supervisory Committee must receive a complete copy of the thesis two weeks prior to the defense date. The final thesis must be approved by a majority of the Committee.

The Supervisory Committee for Plan II, Non-thesis students consists ONLY of the advisor who approves the program of study and final application for degree. The instructor of the student’s Graduate Seminar must sign the Notification of Oral Examination (see FORMS) to confirm that the student successfully completed the required technical presentation in MAE 683 or MAE 684 (see GRADUATE SEMINAR REQUIREMENTS). This technical presentation represents the student’s Comprehensive Exam.

**CANDIDACY**
A student admitted to the MSE or MSASE Program is a candidate for the degree if he/she has met all admissions requirements, is not on probation, has an approved Program of Study on file in the Office of Admissions and Records, and has an average of B or better on all graduate work attempted at UAHuntsville.

**FINAL EXAMINATION**
For Plan I MSE and MSASE students, the Final Examination is an oral presentation of the thesis in the form of a seminar before the student’s Supervisory Committee and is open to members of the University community. Approval of the thesis by a majority of the Committee is required. Students cannot schedule their final examination unless they are in good academic standing. Plan I students must also be enrolled in thesis hours (MAE 699) in the semester they defend and or graduate. The Supervisory Committee can also recommend a Ph.D. Preliminary Exam waiver for...
a Plan I student by approving the Preliminary Exam Waiver (see FORMS) at the Final Exam. This request for a waiver must be submitted to the Department Chair when the final thesis manuscript is submitted for review.

TIME LIMIT
All requirements for the MSE or MSASE degree should be completed in not more than six years. Credit for individual graduate courses completed at UAHuntsville more than six years but less than ten years before the completion of all requirements for the degree may be validated by special examination. Such an examination, given by the department in which the course is offered, can be taken only once and will be the equivalent of a final exam. The form entitled VALIDATION OF COURSES BEYOND THE SIX YEAR LIMIT (see FORMS) must be submitted to confirm successful validation.

APPLICATION FOR DEGREE
Each MSE and MSASE candidate must apply for the degree by submitting the appropriate form and fee through Charger Central at least three months before it is to be conferred. Consult the Graduate Studies website for specific deadline date.
MSE/MSASE DEGREE CHECKLIST
The checklist in Table 3 summarizes the steps to follow to ultimately attain a MSE or MSASE degree in the MAE Department. Note the dates indicated and the forms to be filed. The individual forms show the required approvals and number of copies needed or specified by the Department and Graduate Studies. Students should also refer to the section entitled MASTER'S AND Ph.D. STUDENTS DATES & DEADLINES for important dates and deadlines designated by the Graduate School.

Table 3 - MSE and MSASE Degree Checklist

<table>
<thead>
<tr>
<th>Step</th>
<th>Date / Deadline</th>
<th>Forms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submit Application to UAHuntsville Graduate Studies</td>
<td>June 15 – Fall; October 15 – Spring; March 15 – Summer</td>
<td><a href="http://www.uah.edu/graduate/admissions/application">http://www.uah.edu/graduate/admissions/application</a></td>
</tr>
<tr>
<td>Fill out MAE Graduate Student Information Form</td>
<td>Return to MAE Department as soon as possible.</td>
<td>MAE Department Graduate Student Information (see FORMS)</td>
</tr>
<tr>
<td>▶ Select a permanent Advisor</td>
<td>No later than the end of the semester in which student will have accumulated 12 credit hours.</td>
<td>Program of Study for MSE and MSASE Degrees (see FORMS)</td>
</tr>
<tr>
<td>▶ Form Supervisory Committee</td>
<td></td>
<td></td>
</tr>
<tr>
<td>▶ Submit a Program of Study to the Graduate School</td>
<td></td>
<td></td>
</tr>
<tr>
<td>▶ Submit thesis proposal to Supervisory Committee for approval (Plan I).</td>
<td>No later than the end of the semester in which student will have accumulated 24 credit hours.</td>
<td></td>
</tr>
<tr>
<td>▶ Identify journal for manuscript submittal (Plan I).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>▶ Verify Program of Study or petition for PoS Change</td>
<td>At least one semester before Graduation.</td>
<td>Change to Program of Study <a href="http://www.uah.edu/graduate/resources/forms">http://www.uah.edu/graduate/resources/forms</a> Validation of Courses Beyond The Six Year Limit (see FORMS)</td>
</tr>
<tr>
<td>▶ Validate Courses Beyond Six Year Limit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Submit form to change Supervisory Committee membership (if needed) including valid reason for change.</td>
<td>At least one semester before Graduation.</td>
<td>Petition for Change in Graduate Supervisory Committee <a href="http://www.uah.edu/graduate/resources/forms">http://www.uah.edu/graduate/resources/forms</a></td>
</tr>
<tr>
<td>File Application for Advanced Degree</td>
<td>At least 3 months before Final Exam/Defense.</td>
<td>Application for Advanced Degree <a href="http://www.uah.edu/graduate/resources/forms">http://www.uah.edu/graduate/resources/forms</a></td>
</tr>
<tr>
<td>Present thesis research in a Graduate Seminar (Plan I)</td>
<td>▶ Typically same semester of thesis oral examination.</td>
<td></td>
</tr>
<tr>
<td>▶ Must have completed or be concurrently enrolled in MAE 699.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schedule Final Oral Examination (Plan I)</td>
<td>▶ At least two weeks in advance of Exam.</td>
<td>Notification of Oral Examination/Defense <a href="http://www.uah.edu/graduate/resources/forms">http://www.uah.edu/graduate/resources/forms</a></td>
</tr>
<tr>
<td>▶ Exam must be taken at least one month before graduation, and not earlier than the semester in which the student completes all required course work.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step</td>
<td>Date / Deadline</td>
<td>Forms</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Prepare journal article manuscript in appropriate format.</td>
<td>✚ Present draft manuscript to Supervisory Committee at oral thesis defense.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>✚ Submit final manuscript with final thesis document.</td>
<td></td>
</tr>
<tr>
<td>Make Final Comprehensive Exam technical presentation (Plan II, Non-thesis) in Graduate Seminar.</td>
<td>Semester after completing 24 hours of graduate course work or in last 2 semesters.</td>
<td></td>
</tr>
<tr>
<td>Advisor submits results of Final Oral Examination (Plan I and Plan II).</td>
<td>Final results must be reported to the Graduate School by approximately the tenth week of the semester in which the degree is expected. See Graduate School Calendar for date.</td>
<td>Report of Oral Examination Committee <a href="http://www.uah.edu/graduate/resources/forms">http://www.uah.edu/graduate/resources/forms</a></td>
</tr>
<tr>
<td>Based on Supervisory Committee approval, Advisor submits Ph.D. Preliminary Exam Waiver form (Plan I).</td>
<td></td>
<td>Preliminary Exam Waiver (see FORMS)</td>
</tr>
<tr>
<td>Submit five copies of final signed thesis ready for binding to the Graduate School (Plan I).</td>
<td>Approximately the tenth week of the semester in which the degree is expected. See Graduate School Calendar for date.</td>
<td></td>
</tr>
<tr>
<td>Pay thesis binding and graduation fee (Plan I).</td>
<td>At least two weeks before Commencement.</td>
<td></td>
</tr>
<tr>
<td>Participate in commencement (optional).</td>
<td>See Graduate School calendar for exact date.</td>
<td></td>
</tr>
</tbody>
</table>
DOCTOR OF PHILOSOPHY DEGREE REQUIREMENTS

The Doctor of Philosophy (Ph.D.) degrees in Mechanical Engineering (ME) and Aerospace Systems Engineering (ASE) at UAHuntsville are research-oriented degrees awarded upon completion of a defined Program of Study, demonstration of scholarly competence, distinctive achievement in a special field, and demonstrated ability to do an independent, original investigation. Demonstration of substantial scholarly research accomplishments, rather than mere accumulation of residence and course credits, is an essential consideration in awarding the Ph.D. degree.

In addition to required coursework, a PhD student must pass three examinations before being awarded the degree: the Preliminary Examination, the Qualifying Examination, and the Final Comprehensive Examination. Specific details on each examination are provided in the section entitled EXAMINATIONS. A student is officially admitted to either Ph.D. Program only after satisfactorily passing the Preliminary Examination or with an approved exam waiver.

ADMISSION REQUIREMENTS
A Ph.D. candidate must be admitted to the School of Graduate Studies before being admitted to the Ph.D. program. Admission is limited to those whose background shows distinct promise of success in the program. Table 4 summarizes the requirements for the UAHuntsville Ph.D. program for students with a MSE or MSASE degree from UAHuntsville or from another graduate institution. Applicants are evaluated on the basis of their overall records. A minimum graduate grade point average of 3.25 is required before an application will be processed.

Table 4 – Ph.D. Program Requirements For Students with a MSE or MSASE Degree

<table>
<thead>
<tr>
<th>Degree</th>
<th>Course Hours Accepted from MS Degree</th>
<th>Minimum Additional Course Hours for PhD</th>
<th>Preliminary Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>UAH MSE or MSASE Plan I, Thesis</td>
<td>33 (can include up to 9 hrs of MAE 699)</td>
<td>15</td>
<td>Preliminary Exam is waived based on GPA ≥ 3.5 AND recommendation of MSE/MSASE Supervisory Committee</td>
</tr>
<tr>
<td>UAH MSE or MSASE Plan II, Non-Thesis</td>
<td>33</td>
<td>15</td>
<td>Must take by semester after completion of 12 course hours, Score ≥ 60%</td>
</tr>
<tr>
<td>Non-UAH MSE or MSASE</td>
<td>33 (can include up to 9 hrs of thesis credit, but excludes graduate seminar)</td>
<td>15</td>
<td>Must take by semester after completion of 12 course hours, Score ≥ 60%</td>
</tr>
</tbody>
</table>
PROGRAM OF STUDY
The Ph.D. Program of Study should exhibit both a breadth of understanding of engineering with a demonstrated depth in a focused area of Aerospace or Mechanical Engineering. As shown in Tables 5 and 6, both the Ph.D. in Mechanical Engineering and Aerospace Systems Engineering Programs of Study consists of a minimum of 67 course and research credit hours beyond the BSE degree. The course credit hour requirement for students with a MSE or MSASE degree is a minimum of 48 semester hours, that is, a minimum of 15 semester hours beyond the MSE or MSASE degree.

Table 5 – Ph.D. in Mechanical Engineering Program Requirements (67 hours minimum)

<table>
<thead>
<tr>
<th>Minimum Course Hours</th>
<th>Minimum Research Hours</th>
<th>Other</th>
<th>Exams</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>18 hrs of MAE 799;</td>
<td></td>
<td>Preliminary Exams³</td>
</tr>
<tr>
<td>27 – major</td>
<td>After passing Qualifying Exam, must enroll in 3 hrs each Fall/Spring semester until degree requirements completed.</td>
<td>1 hr of MAE 683 unless taken during UAH MSE or MSASE degree.</td>
<td>Qualifier</td>
</tr>
<tr>
<td>12 – 1st minor¹</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 - 2nd minor²</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹ 12 hours of technical electives approved by supervisory committee.
² MAE 692 plus additional 6 hours of mathematics approved by supervisory committee. MAE 671 can count toward additional hours.
³ Student must take the Preliminary Exam by the semester after completing 12 hours of graduate course work at UAHuntsville or have a waiver approved by their MSE Supervisory Committee.

The specific Program of Study for the Ph.D. in Mechanical Engineering is designed by the student, his/her advisor, and the supervisory Committee. The major area consists of a minimum of 27 semester hours of course work within MAE and related departments. A minimum of 12 semester hours of course work is required for the first minor and a minimum of 9 semester hours for the second. One of the minors must be in mathematics, which typically includes MAE 692 and MAE 693. Any Ph.D. ME candidate that did not take MAE 683 or 684 during their MSE or MSASE degree at UAHuntsville must take MAE 683 (see GRADUATE SEMINAR POLICY).
Table 6 – Ph.D. in Aerospace Systems Engineering Program Requirements (67 hours minimum)

<table>
<thead>
<tr>
<th>Minimum Course Hours</th>
<th>Minimum Research Hours</th>
<th>Other</th>
<th>Exams</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>18 hrs of MAE 799; After passing Qualifying Exam, must enroll in 3 hrs each Fall/Spring semester until degree requirements completed.</td>
<td>1 hr of MAE 684 unless taken as part of UAH MSASE degree.</td>
<td>Preliminary Exam³; Qualifying Exam</td>
</tr>
<tr>
<td>27 – major</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 – 1st minor¹</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 - 2nd minor²</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹ ISE 627 plus additional 9 hours of technical electives approved by supervisory committee.
² MAE 692 and ISE 601 plus additional 3 hours of math approved by supervisory committee.
³ Student must take the Preliminary Exam by the semester after completing 12 hours of graduate course work at UAHuntsville or have a waiver approved by their MSASE Supervisory Committee.

The specific Program of Study for the Ph.D. in Aerospace Systems Engineering is designed by the student, his/her advisor, and the supervisory Committee. The major area consists of a minimum of 27 semester hours of course work within MAE and related departments. A minimum of 12 semester hours of course work, including ISE 627, is required for the first minor. A minimum of 9 semester hours of mathematics, including MAE 692 and ISE 601, is required for the for the second minor. Any Ph.D. ASE candidate that did not take MAE 683 or MAE 684 during their MSE or MSASE degree at UAHuntsville must take MAE 684 (see GRADUATE SEMINAR POLICY).

CONTINUOUS REGISTRATION
All students who have completed the minimum coursework requirements for either Ph.D. degree must register for a minimum of 3 semester hours of graduate credit (course or MAE 799 credit) each Fall and Spring semester until all degree requirements are complete.

GRADE REQUIREMENTS
All Ph.D. students must maintain a satisfactory academic standing to continue their degree program. Satisfactory standing includes the following:

1. Average grade on the courses numbered 600 and above cannot be less than B; and
2. A minimum grade of B must be attained in each engineering course in the student’s Program of Study designated by a number less than 600. If a lower grade is attained, a substitution of another approved course is required.
3. Engineering courses numbered between 500-599 may be taken for graduate credit with prior approval of such courses on the student's Program of Study. Graduate students may be required to do extra work of appropriate nature in 500-level courses.
4. The number of 500 level course credit hours for the entire Ph.D. program (including MSE or MSASE coursework) shall not exceed twelve (12).
TRANSFER CREDIT
Students entering with an accredited MSE or MSASE degree may transfer up to 33 hours (including up to 9 hours of thesis credit) toward a Ph.D. degree. The number of additional credit hours that may be transferred from other accredited institutions is limited to 6 beyond an MSE or MSASE degree. These additional hours must be in one of the following categories:

1. Graduate work completed elsewhere before admission to UAH and for which a degree was not awarded;
2. Graduate work completed elsewhere after admission to UAH and for which a degree was not awarded; or
3. Graduate work completed in the senior year at UAH that was not applied to the baccalaureate.

Additional rules governing transfer of credit are contained in the UAHuntsville Graduate Catalog. A student considering taking graduate work elsewhere during a leave of absence should consult his advisor about plans and any courses that may be offered for transfer. All courses approved for transfer must be recorded in the list of proposed courses on the Ph.D. Program of Study. The transfer of courses from another university must be approved through the School of Graduate Studies before submission of the proposed course list.

DISSERTATION
The dissertation is evidence that the student can independently identify a problem of contemporary significance through familiarity with the current literature in the major field, organize and execute a program of research, recognize and analyze the results, and present them in a cogent exposition written in fluent, acceptable English. Dissertation results are expected to be submitted for refereed scholarly publication. All dissertations are expected to be accessible to the general public. Students must register for a minimum of 18 semester hours of dissertation during the time they are actively conducting research and consulting their dissertation advisor. These hours can also be used to count toward the continuous registration requirement.

A completed copy of the dissertation must be submitted to the MAE Department at least eight weeks before the end of the semester in which degree requirements are expected to be completed. Detailed procedures for submission of the dissertation can be found at http://www.uah.edu/graduate. After the student has passed his/her dissertation defense and at least five weeks before the end of the semester in which degree requirements are expected to be completed, a copy of the dissertation signed by the Supervisory Committee, Department Chair and College Dean must be submitted to the Office of Graduate Studies for final proofreading and approval by the Graduate Dean. Six printed copies and one digital copy of the final approved dissertation must be deposited in the Office of Graduate Studies along with applicable forms and fees one week prior to the end of the semester. Theses must comply with the regulations set forth in the Graduate School’s Thesis and Dissertation Manual, available online at http://www.uah.edu/graduate/resources/thesis-manual.
JOURNAL SUBMITTAL
Each Ph.D. student is required to derive at least one manuscript from their dissertation for consideration for publication as an article in an appropriate journal. The specific journal should be chosen in consultation with the advisor and Supervisory Committee. A draft of this manuscript must be submitted to the Supervisory Committee at the oral Final Examination. The final revised manuscript must be provided to the student’s advisor when the final dissertation manuscript is submitted. The manuscript may be included as an appendix to the dissertation. The manuscript must be appropriately formatted as specified by the journal editors. If an article based on the dissertation research is previously accepted, it should be noted on the Report of Oral Examination Committee (see FORMS) and documented in an appendix of the dissertation.

SUPERVISORY COMMITTEE
Immediately after admission to a Ph.D. program the student chooses a permanent advisor and a Supervisory Committee consisting of a Committee Chair (typically the advisor) and at least four additional members. The Chair and at least half of the Committee must:

1. Be full-time UAH faculty members; and
2. Have full membership in the graduate faculty.

The Supervisory Committee members are subject to approval of the Department Chair and the Graduate Dean. At least three of the committee members should represent the major field of study and one or more should be from the minor fields. Under the guidance of the faculty dissertation advisor the student will be allowed to register for dissertation, MAE 799.

EXAMINATIONS
A student must pass three examinations before being awarded the Ph.D. degree. These are the Preliminary Exam, the Qualifying Exam, and the Final or Dissertation Exam.

Preliminary Examination
The Preliminary Examination is a written test of the student's capability to successfully pursue the Ph.D. Candidates for the Ph.D. degree must take the Preliminary Exam before completing no more than 12 hours of graduate course work at UAHuntsville or have a waiver approved by their MSE or MSASE Supervisory Committee, or the Department Graduate Program Committee, in their permanent file. Failure to take the exam within the prescribed period will result in the student’s admission to the Ph.D. program being voided.

The Preliminary Exam is administered in accordance with the procedure provided in the MAE DEPARTMENT PRELIMINARY EXAM HANDBOOK. The handbook also includes typical exam problems. A score of 60% or greater is required to pass. A student who fails this examination may repeat it for the second time. In extenuating circumstances a student may submit a petition to the MAE Department Chair with the signed concurrence of a faculty member, for a third attempt. The Graduate Program Committee will review this petition for approval or disapproval.

For the Ph.D. in Mechanical Engineering, the Preliminary Exam consists of a major area, a minor area, and a second minor area of mathematics based on MAE 692 and 671. CHE students may choose Chemical Engineering as a major.
For the Ph.D. in Aerospace Systems Engineering, the Preliminary Exam consists of a major area, a minor area in Systems Engineering based on ISE 627, and a second minor area of mathematics based on MAE 692 and ISE 601.

A waiver of the Preliminary Examination may be granted to students who completed their MSE or MSASE in Mechanical, Aerospace or Chemical Engineering at UAHuntsville with a thesis option (Plan I) and a grade point average of 3.5 or above. The student’s Supervisory Committee recommends the waiver by signing the Preliminary Exam Waiver (see FORMS) at the oral Final Exam for the MSE thesis. The request for waiver from the Preliminary Examination must be submitted to the Department Chair when the final thesis manuscript is submitted for review.

Qualifying Examination
The Qualifying Examination is a written and oral test of the student's knowledge in the major and minor fields of study and is administered by their advisor and Supervisory Committee within one year of the date he/she completes the formal coursework on the Program of Study. The student must be enrolled in Dissertation hours (MAE 799) in the semester he/she is scheduled to take the Qualifying Exam.

The Qualifying Exam is conducted in two distinct stages. The first stage is a demonstration through a written examination that the student is proficient in the subject matter in the Program of Study. The second stage is an oral review of the written exam and a dissertation proposal.

The closed book, written portion of the Qualifying Examination is approximately 4 hours in length. The exam may cover all courses in the major and minor areas. The problem format may also be specified to demonstrate how the student’s courses apply toward their dissertation topic. The major advisor is responsible for administering this examination. The advisor may, at his own discretion, solicit problems from the members of the Supervisory Committee and/or from any faculty members as deemed necessary. Acceptability of the written examination is determined solely by the major advisor or with the consultation of the members of the Supervisory Committee if so desired. The results of this examination should be made available to all members of the Supervisory Committee at the time of the oral review and will be retained as a permanent record in the student's file.

If the written portion of the exam is deemed acceptable by the major advisor, then the oral portion of the Qualifying Examination will be scheduled through the School of Graduate Studies by submitting the Notification of Oral Exam/Defense (see FORMS) at least two weeks in advance. All members of the Advisory Committee shall participate in this oral examination. The student’s performance on the written exam will be reviewed. Additional related questions may be asked to clarify the student’s answers. The second portion of the oral exam is the dissertation proposal review in which the student makes an oral presentation describing the proposed dissertation research. Both the dissertation topic and expected approach must be clearly delineated to the Supervisory Committee’s satisfaction in order for a pass to be granted.
Once the oral review is complete, the results of the Qualifying Examination are reported to the School of Graduate Studies within two working days by submitting the REPORT OF ORAL EXAMINATION COMMITTEE (see FORMS). The presentation of the oral dissertation proposal may be given no more than twice.

**Final Examination**

The Final Examination or Dissertation Defense is an oral presentation of the dissertation in the form of a seminar before the student's Supervisory Committee and is open to the members of the University community. Approval of the dissertation by a majority of the Committee is required. Students cannot schedule their Final Examination unless they are in good academic standing. Ph.D. students must also be enrolled in dissertation hours (MAE 799) in the semester they defend and or graduate.

The Final Examination must be given at least six weeks before the end of the semester in which degree requirements are expected to be completed, and the results reported within two working days to the Graduate Dean. The Graduate Dean appoints an additional member of the graduate faculty to act as observer for all dissertation defenses.

Once set, the examination becomes an official Graduate School matter and the date cannot be changed without prior arrangement amongst the Supervisory Committee members and the student and without approval of the Graduate Dean. For more details consult the Graduate School Handbook. A student may take the final examination no more than twice.

**TIME LIMIT**

All requirements for the Ph.D. degree must be completed in no more than five years after the student has passed the Qualifying Examination. Any deviation from this rule or time extension is subject to approval by the Graduate Program Committee with the recommendation of the advisor. An extension must also be approved by the Graduate Dean.

**APPLICATION FOR DEGREE**

Each candidate for a Ph.D. degree must apply for the degree by submitting the appropriate form and fee through Charger Central at least three months before it is to be conferred. Consult the Graduate Studies website for specific deadline dates.
Ph.D. DEGREE CHECKLIST
The checklist in Table 7 summarizes the steps to follow to ultimately attain a Ph.D. degree in the MAE Department. Note the dates indicated and the forms to be filed. The individual forms show the required approvals and number of copies needed or specified by the Department and Graduate Studies. Students should also refer to the section entitled MASTER’S AND Ph.D. STUDENTS DATES & DEADLINES for important dates and deadlines designated by the Graduate School.

Table 7 - Ph.D. Degree Checklist

<table>
<thead>
<tr>
<th>Step</th>
<th>Date / Deadline</th>
<th>Forms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submit Application to UAHuntsville Graduate Studies</td>
<td>June 15 – Fall; October 15 – Spring; March 15 – Summer</td>
<td><a href="http://www.uah.edu/graduate/admissions/application">http://www.uah.edu/graduate/admissions/application</a></td>
</tr>
<tr>
<td>Fill out MAE Graduate Student Information Form</td>
<td>Return to MAE Department as soon as possible.</td>
<td>MAE Department Graduate Student Information (see FORMS)</td>
</tr>
<tr>
<td>Take Preliminary Exam or request waiver. (Score ≥ 60% is passing)</td>
<td>Must be taken in the fall or spring semester after completion of 12 hours of graduate course work.</td>
<td>Report of Ph.D. Preliminary Examination <a href="http://www.uah.edu/graduate/resources/forms">http://www.uah.edu/graduate/resources/forms</a> Preliminary Exam Waiver (see FORMS)</td>
</tr>
<tr>
<td>Select a permanent Advisor</td>
<td>Soon after admission</td>
<td>Program of Study for Ph.D. Degree (see FORMS)</td>
</tr>
<tr>
<td>Form Supervisory Committee</td>
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<tr>
<td>Submit a Plan of Study to the Graduate School</td>
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<tr>
<td>Select dissertation topic in consultation with Advisor</td>
<td>As early as possible</td>
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<tr>
<td>Identify journal for manuscript submittal</td>
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<tr>
<td>Verify Program of Study or petition for PoS Change</td>
<td></td>
<td>Change to Program of Study <a href="http://www.uah.edu/graduate/resources/forms">http://www.uah.edu/graduate/resources/forms</a></td>
</tr>
<tr>
<td>Schedule written portion of Qualifying Exam</td>
<td>Within one year after completing coursework on Program of Study</td>
<td></td>
</tr>
<tr>
<td>Advisor submits results of Qualifying Exam</td>
<td>Within two working days</td>
<td>Report of Oral Examination Committee <a href="http://www.uah.edu/graduate/resources/forms">http://www.uah.edu/graduate/resources/forms</a></td>
</tr>
<tr>
<td>Schedule oral portion of Qualifying Exam</td>
<td>Within one semester of passing written portion of Qualifying Exam and at least two weeks in advance.</td>
<td>Notification of Oral Examination/Defense <a href="http://www.uah.edu/graduate/resources/forms">http://www.uah.edu/graduate/resources/forms</a></td>
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<tr>
<td>Enroll in at least three hours of course credit or MAE 799 each Fall and Spring semester until degree requirements are complete.</td>
<td>After completing minimum coursework requirements and passing the Qualifying Examination</td>
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<tr>
<td>Step</td>
<td>Date / Deadline</td>
<td>Forms</td>
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<tr>
<td>Submit form to change Supervisory Committee membership (if needed)</td>
<td>At least one semester before Graduation.</td>
<td>Petition for Change in Graduate Supervisory Committee</td>
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<td>including valid reason for change.</td>
<td></td>
<td><a href="http://www.uah.edu/graduate/resources/forms">http://www.uah.edu/graduate/resources/forms</a></td>
</tr>
<tr>
<td>File Application for Advanced Degree</td>
<td>At least 3 months before Final Exam/Defense.</td>
<td>Application for Advanced Degree</td>
</tr>
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<td><a href="http://www.uah.edu/graduate/resources/forms">http://www.uah.edu/graduate/resources/forms</a></td>
</tr>
<tr>
<td>Schedule Final Oral Examination and provide dissertation draft to</td>
<td>➢ At least two weeks in advance of Exam.</td>
<td>Notification of Oral Examination/Defense</td>
</tr>
<tr>
<td>Supervisory Committee.</td>
<td>➢ Exam must be taken at least six weeks before the end of the semester in which</td>
<td><a href="http://www.uah.edu/graduate/resources/forms">http://www.uah.edu/graduate/resources/forms</a></td>
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<td>degree requirements will be completed.</td>
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<td></td>
<td>➢ Must be enrolled in dissertation hours (MAE 799).</td>
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<tr>
<td>Prepare journal article manuscript in appropriate format.</td>
<td>➢ Present draft manuscript to Supervisory Committee at oral dissertation defense.</td>
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<td>➢ Submit final manuscript with final dissertation document.</td>
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</tr>
<tr>
<td>Advisor submits results of Final Oral Examination.</td>
<td>Within two working days after passing exam.</td>
<td>Report of Oral Examination Committee</td>
</tr>
<tr>
<td></td>
<td></td>
<td><a href="http://www.uah.edu/graduate/resources/forms">http://www.uah.edu/graduate/resources/forms</a></td>
</tr>
<tr>
<td>Submit five copies of final signed dissertation ready for binding to</td>
<td>Approximately the tenth week of the semester in which the degree is expected.</td>
<td></td>
</tr>
<tr>
<td>the Graduate School</td>
<td>See Graduate School Calendar for date.</td>
<td></td>
</tr>
<tr>
<td>Pay thesis binding and graduation fee</td>
<td>At least two weeks before Commencement.</td>
<td></td>
</tr>
<tr>
<td>Participate in commencement (optional).</td>
<td>See Graduate School calendar for exact date.</td>
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</tbody>
</table>
GRADUATE COURSE LISTING

MECHANICAL & AEROSPACE ENGINEERING (MAE)

520 Compressible Aerodynamics (3 hrs)
Principles of compressible flow including area change, friction and heat transfer. Fundamentals of acoustic waves, one and two-dimensional shock and expansion waves, shock-expansion theory, and linearized flow with application to inlets, nozzles, wind tunnels, and supersonic flow over aerodynamic bodies and wings. Prerequisites: MAE 310, 341 (Same as MAE 420).

530 Fundamentals of Aerodynamics (3 hrs)
Application of the principles of fluid mechanics and thermodynamics to the prediction of aerodynamic performance of aircraft, missiles and other flight vehicles. Topics include lift and drag, thrust and power, and the influence of wing loading, power loading, zero-lift drag, wing geometry, high lift devices Mach number, etc., on the performance and design trades of flight vehicles. Prerequisite: Prerequisites: MAE 310, 341 (Same as MAE 430).

531 Introduction to Plasma Dynamics (3 hrs)
Single particle motion in magnetic fields; fluid equations and fluid theory wave modes; MHD theory, stability, and wave modes; introduction to kinetic theory and hot plasma wave modes. Prerequisites: PH 421, 432 (Same as PH 531).

540 Rocket Propulsion I (3 hrs)
Introduction to the operation, analysis, and design of liquid and solid rockets. The course incorporates an experience in design and realization of a thermal system, in which students work in teams to design a rocket motor or component. Prerequisites: 420/520 (Same as MAE 440).

541 Airbreathing Propulsion (3 hrs)
Survey of airbreathing propulsion systems with special emphasis on gas turbine engines for aircraft and rotorcraft. Thermodynamic power cycles, design of components, and overall engine performance analysis. Discussion of practical design and operations considerations including engine controls, reliability, and durability. The course incorporates an experience in design and realization of a thermal system in which students work in teams to design a turbine engine. Prerequisites: 420/520 (Same as MAE 441).

542 Internal Combustion Engines (3 hrs)
Application of principles of thermodynamics, heat transfer, and fluid mechanics to combustion engines and turbines. Basic engine types, engine components, idealized cycles, combustion, fuels, engine variables, testing, exhaust gas analysis, and air pollution as related to spark-ignition, compression-ignition, and turbine engines. Prerequisites: MAE 342, 410, 450.
544 Introduction to Electric Propulsion  (3 hrs)
Elements of electrically-driven rocket propulsion for applications from low earth orbit to the outer planets will be discussed. The physics of ionizing and heating gases and plasmas for electrothermal, electrostatic and electromagnetic acceleration will be studied. Characteristics of Resistojet, Arcjet, Magnetoplasmadynamic thrusters, Electrothermal, Pulsed plasma, Electrostatic, and Hall thrusters will be covered. Review thruster system performance, power requirements and selection for space missions. Overview of current research efforts, including thruster systems, physics and performance.

545 Heat Distribution System Design  (3 hrs)
Design of hydronic and air distribution systems used in heating and air conditioning. Piping design, pump selection, heat coils, room air distribution, ducting design, fan selection, controls, and complete systems. Prerequisite: MAE 410; MAE 455 recommended.

546 Solar Energy Systems  (3 hrs)
Components for solar-energy systems (collectors, heat exchangers, thermal storage). Numerical simulation of solar energy systems, and solar energy system design. Residential and commercial space heating, process heating, and hybrid system applications. Prerequisite: MAE 455; MAE 410 recommended.

548 Energy Conversion and Power Generation  (3 hrs)
Application of principles of thermodynamics and fluid mechanics and economics to analysis and design of conventional hydro and steam power plants. Energy sources and end uses, fossil fuels, combustion equipment, steam generators, and pollution control devices. Hydro, steam and wind turbines. Prerequisites: MAE/CHE 352, MAE 442, 454; MAE 446 recommended.

561 Vibrations of Elastic Systems  (3 hrs)
Formulation of the equations of motion of discrete and continuous systems, analytical and numerical methods of solution, eigenvalue problems, and dynamic response. Prerequisite: MAE 488 (Same as MAE 461).

563 Intermediate Dynamics  (3 hrs)
Kinematics and dynamics of particles, system of particles, and rigid-bodies. Variational principles and Lagrangian mechanics. Prerequisite: MAE 272 (Same as MAE 463).

568 Elements of Spacecraft Design  (3 hrs)
Fundamentals of spacecraft engineering and design. Topics include: orbital mechanics, space environment, attitude determination and control, communications, space structures, thermal control, propulsion and power, and systems and mission design. Prerequisites: MAE 272, 371, 450, 420/520 (Same as MAE 468).
574 Applied Mechanics of Solids (3 hrs)
Stresses and strains at a point, theories of failures, stress concentration factors, thick-walled cylinders, torsion of noncircular members, curved beams, unsymmetrical bending, and shear center. Prerequisite: MAE 370 (Same as CE 474).

577 Experimental Techniques in Solid Mechanics (3 hrs)
Experimental methods to determine stress, strain, displacement, velocity, and acceleration in various media. Theory and laboratory applications of electrical resistance strain gages, brittle coatings, and photoelasticity. Application of transducers and experimental analysis of engineering systems. Prerequisite: MAE 370 (Same as MAE 477).

580 Aircraft Stability and Control (3 hrs)
Stability and control of aerodynamic vehicles. Design of aircraft to obtain good flying characteristics. Complete governing equations and analog solutions of linearized equations. Prerequisites: MAE 488, w/Con. MAE 430/530 (Same as MAE 480).

585 Numerical Methods and Engineering Computations III (3 hrs)
Advanced topics in numerical methods and engineering computation including: finite elements and finite differences in solving various engineering problems; Gaussian quadrature; interpolation, integration, and differentiation; and stability and convergence analysis of iterative methods. Numerical applications to fluid mechanics, heat transfer, structural mechanics, and machine design. Prerequisite: MAE 385 (Same as MAE 485).

589 Computer-Aided Engineering (4 hrs)
Application of computer methods in the analysis and design of structural, thermal, and dynamical systems. Use of state-of-the-art finite element and finite difference computer programs. Practical guidelines for discrete modeling and analysis of modeling errors. Comparison of exact and approximate solutions to boundary value problems. Use of microcomputers in engineering design and analysis. Prerequisite: MAE 370, 385 (Same as MAE 489).

593 Rocket Design (3 hrs)
Design, build, test and fly a high-powered rocket with a payload to a specified altitude. Students work on multi-disciplinary teams to design payloads, avionics, recovery systems, structures and other sub-systems and then integrate them into the final vehicle. Prerequisite: Permission of Instructor.

594 Aircraft Design (3 hrs)
Design and build an unmanned aircraft to meet specified requirements and then verify design through ground and flight tests. Students work on multi-disciplinary teams to address configuration aerodynamics, avionics, structures, propulsion/power and payloads. Systems engineering aspects including simulation, fabrication, integration, scheduling and cost estimation are also emphasized. Prerequisite: Permission of Instructor.

595 Selected Topics in Mechanical & Aerospace Engineering (Credit to be arranged)
The following courses are open to graduate students only:

623 Computational Fluid Dynamics I (3 hrs)
Formulations by finite difference, finite element, finite volume, and spectral element methods for incompressible and compressible flows. Explicit and implicit methods, Von Neumann error analysis, consistency, convergence, and accuracy. Prerequisites: MAE 310, 385.

631 Rotorcraft Design I (3 hrs)
Conceptual design of rotorcraft systems with an emphasis on multi-disciplinary design. Comprehensive methodologies for vehicle synthesis and sizing including consideration of aerodynamics, propulsion, materials and structures, flight performance and control, and operations. Integration of advanced technologies. Rotorcraft Design I and II are the capstone design courses for the Aerospace MSE Program of Study in Rotorcraft Systems Engineering. Prerequisite: MAE 657.

632 Rotorcraft Design II (3 hrs)
Continuation of Rotorcraft Design I including higher fidelity simulations and trade studies. Consideration of maneuverability, structural dynamics, drive train and hub design, advanced flight control system design, sensors, weapons, component integration, and packaging, and life-cycle cost. Rotorcraft Design I and II are the capstone design courses for the Aerospace MSE Program of Study in Rotorcraft Systems Engineering. Prerequisite: MAE 631.

633 Tactical Missile Design I (3 hrs)
Conceptual design of missile systems with an emphasis on multi-disciplinary design. Comprehensive methodologies for vehicle synthesis and sizing including consideration of aerodynamics, propulsion, materials and structures, flight performance and control, and operations. Integration of advanced technologies. Tactical Missile Design I and II are the capstone design courses for the Aerospace MSE Program of Study in Missile Systems Engineering. Prerequisite with concurrency: MAE 755.

634 Tactical Missile Design II (3 hrs)
Continuation of Tactical Missile Design I including higher fidelity simulations and trade studies. Consideration of trajectory modeling and simulation, open-loop flight control system design, sensors, component integration and packaging, and life-cycle cost. Tactical Missile Design I and II are the capstone design courses for the Aerospace MSE program of study in Missile Systems Engineering. Prerequisite: MAE 633.

635 Aerospace Systems Engineering (3 hrs)
Introduction to Integrated Product and Process Development (IPPD) and life cycle analysis with application to Aerospace Systems. Systems engineering and quality engineering methods and tools. Top-down design decision support process. Computer integrated environment and robust design simulation will be addressed. Prerequisite: ISE 601, 690 or permission of instructor.
639 System Safety (3 hrs)
The process of system safety - from the creation and management of a safety program on a system under development, to the analysis that must be performed as this system is designed and produced to assure acceptable risk in its operation. Full discussion of the management and analysis processes and procedures. Incorporates the safety procedures used by the Department of Defense and NASA. Basic statistical methods and network analysis methods which provide an understanding of the engineering analysis methods that follow are covered. Prerequisite: ISE 638.

640 Rocket Propulsion II (3 hrs)
Aerothermodynamics of rocket propulsion systems; rocket propellants and combustion; heat transfer and cooling problems. Application to ramjets and hybrid systems. Prerequisite: MAE 440/540 or permission of instructor. Offered upon demand.

641 Advanced Thermodynamics (3 hrs)
Application of classical thermodynamics. Treatment of problems involving nonideal gases and liquids, phase equilibrium, and chemical equilibrium. Prerequisite: MAE 342 (Same as CHE 641).

643 Advanced Heat and Mass Transfer (3 hrs)
Continuation of MAE 450 in the study of conductive, convective, and radiative heat transfer and mass transfer. Emphasis is placed on heat transfer in turbulent flows and high speed flows, combined mode heat transfer, and mass transfer in reacting flows. Prerequisite: MAE 450.

645 Combustion I (3 hrs)
Combustion chemistry, introduction to mass transfer, chemical kinetics, reactors, simplified governing equations for chemically reacting flow, laminar diffusion and premixed flames. Prerequisite: Permission of instructor.

647 Uncertainty Analysis in Experimentation (3 hrs)
Uncertainty analysis concepts and techniques; application in planning, design, construction, debugging, execution, data analysis and reporting phases of experimental programs. Discussion of national and international standards and current engineering uncertainty analysis literature.

649 Transport Phenomena (3 hrs)
Mass, energy, and momentum transport in steady and transient motions in real and rheological substances. Prerequisite: MAE 450 (Same as CHE 649).

651 Viscous Fluid Mechanics (3 hrs)
Fundamentals of incompressible viscous fluid motion, including development of Navier Stokes equation. Exact and approximate solutions for both large and small Reynolds number. Laminar and turbulent boundary layers. Prerequisite: MAE 410.
657 Helicopter Theory  (3 hrs)
Vertical flight, forward flight, performance, design, mathematics of rotating systems, rotary wing dynamics, rotary wing aerodynamics, helicopter aeroelasticity, stability and control, stall, and noise. Prerequisite: MAE 530.

658 Rotordynamics  (3 hrs)
Torsional and transverse rotor vibration, critical speed and stability analysis, response to unbalance, rotor balancing. Rotordynamic phenomena including: gyroscopic effects, fluid film bearings, annular seals, stiffness asymmetry. Prerequisite: MAE 488 or permission of instructor.

660 Structural Dynamics  (3 hrs)

661 Advanced Dynamics  (3 hrs)
Variational methods, optimization, and dynamic stability. Lagrangian and Hamiltonian formulation for dynamical systems and Hamilton-Jacobi methods to orbital mechanics. Prerequisite: MAE 563.

662 Nonlinear Dynamics and Chaos  (3 hrs)
Nonlinear and chaotic dynamical systems, phase plane, periodic and strange attractors, stability analysis, critical points, Piaunov exponents, bifurcation points, solitons, logistic maps, Poincare and Henon iterative maps, factals, Mandelbrot and Julia sets, chaos in complex dynamical systems. Prerequisites: MA 244, 238.

663 Astrodynamics  (3 hrs)
Astronomical coordinates and time systems; the many-body problems and disturbing functions. General perturbation methods, and application of classical mechanics and Hamilton-Jacobi methods to orbital mechanics. Prerequisite: MAE 563.

671 Continuum Mechanics  (3 hrs)
Kinematics and kinetics, various coordinate systems, constitutive equations for continuous media; governing partial differential equations from first and second laws of thermodynamics; applications to solids, liquids, and gases. Prerequisites: MAE 310, 370 (Same as CE 671).

672 Elasticity  (3 hrs)
Formulation of boundary-value problems of classical elasticity. Application to plane problems, prismatic members, and axisymmetric problems. Introduction to three-dimensional problems. Prerequisite: MAE 671 (Same as CE 672).
673 Plasticity (3 hrs)
Fundamentals of mechanical behavior of metals and nonmetals for stress states greater than the yield stress state. Deformation and flow theories. Stress-strain relations and yield criteria. Solution of boundary value problems with plastic bodies. Limit analysis of structures. Prerequisite: MAE 671 (Same as CE 673).

674 Finite Element Analysis I (3 hrs)
Finite element theory, variational methods, weighted residuals; applications to linear partial differential equations in continuous media; solution of boundary-value and initial-value problems. Prerequisite: MAE 671 (Same as CE 674).

676 Viscoelasticity (3 hrs)

677 Optical Techniques in Solid Mechanics (3 hrs)
Overview of conventional methods for experimental stress analysis. Introduction to applied optics with emphasis on non-destructive, laser-based testing methods, fiber optic recording systems, photoelectronic-numerical data acquisition, and computer aided analysis. Prerequisite: MAE 577 or permission of instructor (Same as CE 677).

678 Mechanics of Composite Materials (3 hrs)
Introduction to composite materials, micro- and macro-mechanical behavior of laminae; bending, buckling and vibration of laminated plates. Prerequisites: MAE 671, 672 (Same as CE 678).

680 Performance Flight Testing (3 hrs)
Fundamentals of rotorcraft test and evaluation. Topics include: test planning, requirements analysis, helicopter performance evaluation, fundamentals of propulsion testing, aviation safety, use of modeling and simulation in flight testing, Department of Defense and Federal Aviation Administration requirements and procedures. Prerequisite: MAE 580, 657.

681 Missile Trajectory Analysis (3 hrs)
Methods for generating trajectories of missiles and projectiles are studied. Point mass approximations are developed using approximations and exact representations of drag and atmospheric conditions. Full six degree-of-freedoms models are developed and solved numerically. Aerodynamic models are developed for both slowly spinning missiles and spin stabilized projectiles. Projectile linear theory is developed and concepts of gyroscopic and dynamic stability are discussed. Rapid trajectory generation is introduced using projectile linear theory. Control of missiles and projectiles are investigated using various using various mechanisms such as canards and pulse jets. Prerequisite: MAE 580.
683 Graduate Seminar (1 hr)
Professional activities designed to promote the skills required to organize and deliver oral technical presentations and to broaden the individual's awareness of technical issues. Students will be graded “S” (satisfactory) or “U” (unsatisfactory) based upon their performance and attendance. Students who do not receive an "S" grade must register for the course until an “S” is obtained. (Same as CE 683). Open to graduate students only.

684 Aerospace Systems Seminar (1 hr)
Seminar course for students in the MS and Ph.D. programs in Aerospace Systems Engineering designed to promote the skills required to organize and deliver oral technical presentations and to broaden the individual’s awareness of technical issues. Students will be graded “S” (satisfactory) or “U” (unsatisfactory) based upon their performance and attendance. Students who do not receive an “S” grade must register for the course until an “S” is obtained. Prerequisites: Open to graduate students only.

692 Graduate Engineering Analysis I (3 hrs)
Ordinary differential equations (ODEs), Bessel functions, Legendre polynomials, Laplace transformations, simultaneous differential equations, application of ODEs to mechanical systems, partial differential equations (PDEs) and boundary-value problems, application of PDEs to mechanical systems. Prerequisite: MA 238. Open to graduate students only.

693 Graduate Engineering Analysis II (3 hrs)
Fourier series and integrals, linear algebra, vectors, vector analysis and integral theorems, introduction to tensor analysis, analytical functions of a complex variable, Taylor and Laurent expansions, the residue theorem, stability criteria, and Calculus of Variations. Prerequisite: MA 238. Open to graduate students only.

695 Selected Topics in Mechanical & Aerospace Engineering (Credit to be arranged.)
Open to graduate students only.

696 - Graduate Internship in Mechanical & Aerospace Engineering (1-9 hrs)
Active involvement in an engineering project in an engineering enterprise, professional organization, or government agency that has particular interest and relevance to the graduate student. Prerequisites: Graduate standing and approval of MAE faculty advisor.

699 Master's Thesis (1, 3, 6, or 9 hrs)
Required each semester in which a student is working and receiving direction on a master's thesis. Minimum of two semesters and 6 hours required for M.S.E. students. A maximum of 9 hours of credit toward Ph.D. requirements is awarded upon successful completion of master's. The 1 hour option is only available to students who have successfully defended their thesis and submitted it for approval, but do not meet the deadlines for graduation in the semester submitted. Students may only use the 1 hour option once in their career. Prerequisites: Requires thesis advisor permission. Open to graduate students only.
723 Computational Fluid Dynamics II  (3 hrs)
Continuation of Computational Fluid Dynamics I, advanced topics in finite difference, finite element, finite volume, and spectral element methods. Prerequisite: MAE 623. *Open to graduate students only.*

724 Computational Fluid Dynamics III  (3 hrs)
Grid generation techniques with structured and unstructured meshes, adaptive meshes, domain decompositions, and parallel processing. Applications of generated meshes to any one of the following problems: turbulence, combustion, acoustics, radiation, multiphase flows, or magnetohydrodynamics. Prerequisite: MAE 723. *Open to graduate students only.*

726 Rotorcraft Computational Fluid Dynamics  (3 hrs)
Full potential, Euler, Navier-Stokes approaches structural and unstructured grids, wake capturing, turbulence, and acoustics. Prerequisite: MAE 651 or permission of instructor. *Open to graduate students only.*

740 Aerothermodynamics  (3 hrs)
Description of the dynamic and thermal fluid flow environments associated with hypervelocity vehicles and propulsion systems with emphasis on thermochemical nonequilibrium behavior. Topics include thermostatistical basis for internal energies, specific heats and shock strengths in dissociated and ionized gases; formulation of reacting flow conservation equations; and recent experimental advances in aerothermodynamics. Prerequisite: MAE 520. *Open to graduate students only.*

741 Statistical Thermodynamics  (3 hrs)
Statistical ensembles; Maxwell-Boltzmann, Bose, Einstein, and Fermi-Dirac statistics. Application of statistical mechanics to thermodynamic processes. Information theory and its formalism. Prerequisite: MAE 641. *Open to graduate students only.*

745 Combustion II  (3 hrs)
Droplet evaporation and burning, introduction to turbulent flow, turbulent diffusion and premixed flames, burning of solids, pollutant emissions, and detonation. Prerequisite: MAE 645. *Open to graduate students only.*

746 Convective Heat Transfer  (3 hrs)
Advanced theory of convective transport processes in fluids, including transport of momentum and energy in laminar flow, boundary layers and turbulent transport in shear flow. Engineering applications include boiling and two phase processes. Prerequisite: MAE 643. *Open to graduate students only.*

748 Radiative Transfer  (3 hrs)
Physics and modeling of radiative transfer. Scattering, remote sensing, and absorption in participating media. Infrared through optical wave lengths. Computational methods in radiative transfer. Prerequisite: Permission of instructor. *Open to graduate students only.*
749 Mass Transport (3 hrs)
Mass transfer in solid and fluid systems under steady and transient conditions. Integration of momentum, heat and mass transfer equations with application to reactive, rheological and multicomponent systems. Prerequisites: MAE 643, 651 (Same as CHE 749).

752 Mechanics of Rarefied Gases (3 hrs)
Application of kinetic theory to rarefied gas-flow problems. Boltzmann statistical distribution; gas-surface interaction, transport properties, free molecule flow; heat-free molecule flow; procedures for non-equilibrium flows. Prerequisite: MAE 651. Offered upon demand. graduate students only.

753 Magneto-Gas Dynamics (3 hrs)
Equations of motion for ionized gases with critical analysis of transport properties in steady and varying electric and magnetic fields. MHD shock waves and radiation effects. Prerequisite: MAE 520.

754 Hypersonic Flow (3 hrs)
Theories for treating the laminar and turbulent boundary layers of reacting fluids, mixtures, related chemical, thermodynamic, and physical phenomena in hypersonic flows. Leading edge bluntness, shock wave interactions, and vorticity effects. Prerequisite: MAE 520.

755 Advanced Aerodynamics (3 hrs)
Transonic, supersonic, and hypersonic flows. Application of compressible potential theory, similarity rules, slender body theory and Newtonian flow theory to the analysis of aerodynamics of aircraft, missiles, re-entry vehicles, and other flight vehicles. Prerequisite: MAE 520, 530, or approval of instructor.

756 Numerical Simulations of Magneto-hydrodynamics (3 hrs)
Finite difference methods for simulation of MHD flows. Methods include explicit scheme, FICE methods, LBL, ADI, artificial damping and projected characteristics for multidimensional time-dependent flow. Prerequisite: MAE 753.

757 Optical Techniques in Fluid Mechanics (3 hrs)
Laser sources, molecular interactions with light and diatomic spectroscopy needed fluorescence, Brillouin scattering, four wave mixing, CARS and other applications in optical fluid diagnostics. Prerequisites: EE 542 (Same as CHE 757).

758 Turbulence (3 hrs)
Turbulence in gases and liquids; boundary layers, atmospheric phenomena. Prerequisite: MAE 651, 671.
760 Analytical Methods in Nonlinear Dynamics  (3 hrs)
Application of averaging methods and perturbation methods to vibrations of nonlinear systems. Analysis of linear systems with periodic coefficients (Floquet theory). Elements of stability theory, Liapunov functions, and Liapunov's direct method. Prerequisite: MAE 660, 661.

762 Wave Motion of Continuous Elastic Bodies  (3 hrs)
Elements of stress wave propagation in bounded elastic media. Propagation of elastic waves in infinite and semi-infinite bodies, cylinders, rods and beams. Prerequisite: MAE 660 (Same as CE 762).

765 Random Vibration of Elastic Systems  (3 hrs)
Dynamic analysis of elastic systems including the response of complex structures to random excitations. Typical excitations include random wind, thermal, earthquake, aerodynamic, and ocean wave phenomena. Probabilistic mechanics methods. Concepts of reliability. Stationary and ergodic processes. Prerequisite: MAE 561 (Same as CE 765).

768 Dynamics of Aerospace Vehicles  (3 hrs)
Elements of advanced rotational kinematics of rigid bodies. Attitude motion of space vehicles in circular and elliptic orbits. Methods of gravitation and spin stabilization of gyrostat. Prerequisites: MAE 660 or 661

772 Theory of Structural Stability  (3 hrs)

773 Theory of Shells  (3 hrs)
Analysis of thin plates and shells including higher order approximation theories and transverse-shear deformations. Illustration of theories by selected problems. Prerequisite: MAE 671 (Same as CE 773).

774 Finite Element Analysis II  (3 hrs)
Advanced topics in finite element analysis; application to nonlinear partial differential equations in continuum mechanics; theoretical studies of convergence and stability of solutions. Prerequisite: MAE 674 (Same as CE 774).

776 Theory of Finite Elasticity and Finite Viscoelasticity  (3 hrs)
Theory of finite deformation analysis for elastic and viscoelastic materials. Constitute models are developed for a functional analysis approach leading to models based on the Cauchy-Green Deformation Tensor and the Strain Energy Density Function. Models discussed include: Mooney-Rivlin and Bernstein-Kearsley-Zappas. Prerequisite: MAE 671.
### 778 Fracture Mechanics (3 hrs)
Theory of crack propagation, stress intensity factors, mapping techniques, series expansion, asymptotic approximations, field singularities, integral transforms, numerical solutions. Prerequisite: MAE 672 (Same as CE 778).

### 780 Theory of Acoustics (3 hrs)
Simple harmonic oscillators, damped and forced oscillators, 1-D wave equation, vibration of a string, 2-D wave equation, vibration of membranes, the acoustic wave equation, plane waves, cylindrical and spherical waves, reflection and transmission, radiation and reception of acoustic waves, absorption and attenuation of sound, cavities and wave guides, and architectural acoustics. Prerequisites: MAE 692.

### 781 Nonlinear Effects in Plasma (3 hrs)
Fundamental physical concepts and methods of estimating various nonlinear interactions in plasmas. Analytical and numerical methods to deal with these problems. Prerequisite: PH 531 or permission of instructor.

### 782 Plasma Turbulence (3 hrs)
Methodology that deals with plasma turbulence together with current numerical techniques to solve these problems approximately, via super-computing. Prerequisite: PH 531 or permission of instructor.

### 795 Selected Topics in Mechanical & Aerospace Engineering Credit to be arranged.

### 799 Doctoral Dissertation (3, 6, or 9 hrs)
Required each semester student is enrolled and receiving direction on doctoral dissertation. Prerequisite: Permission of dissertation advisor
INDUSTRIAL & SYSTEMS ENGINEERING (ISE)

ISE 601 - Introduction to Probability and Statistics for Engineers (3 hrs)
Introduction to descriptive probability models and sampling distributions. Overview of the tools and methodologies of statistics focusing on the application of these methodologies for both estimation and inference that arise in engineering work and with the theory that underlies the methodology. Not for credit for ISE students.

ISE 627 - Engineering Systems (3 hrs)
Development of a systems-scientific framework for the integration of systems theory, systems thinking, systems engineering and systems management. Emphasis is on the conception, design, and management of systems to accommodate complex environments. Prerequisite: Graduate standing.

ISE 638 - Engineering Reliability (3 hrs)
Methodology of reliability prediction including application of discrete and continuous distribution models. Reliability estimation, reliability logic diagrams, life testing, and reliability demonstrations. Prerequisite: ISE 601 or 690

CHEMICAL ENGINEERING (CHE)

540 Physical Properties of Fluids (3 hrs)
Theoretical, experimental, and correlation methods for determining and predicting the thermodynamic and transport properties of various fluids. Critical properties, equations of state, vapor pressure and latent heat, heat capacity. Viscosity, thermal conductivity, diffusion coefficient, phase equilibrium, heat and free energy for formation. Prerequisite: CHE 342. Offered upon demand.

541 Chemical Kinetics And Reactor Design (3 hrs)
Fundamental principles of chemical kinetics and chemical reactor engineering along with the design of both thermal and catalytic reactors. Prerequisites: CHE 344, 443.

549 Introduction To Environmental Engineering (3 hrs)
Engineering aspects of air, water, and thermal pollution. Hydrologic cycle, water sources and uses; industrial and other sources of primary and secondary pollutants. Transport process in environmental problems and in their control. Prerequisite: CHE 442. (Same as CE 549.)

550 Environmental Control (3 hrs)
Engineering design and synthesis of environmental control systems. Control of multi-phase systems with application to air and water pollution control. Prerequisite: MAE/CHE 442 (Same as CE 550).

559 Selected Topics in Chemical Engineering (Credit to be arranged)
560 Introduction to Bioprocess Engineering  
Application of engineering principles to the analysis of and the development and design of processing using biological catalysts including enzymes, plant and animal cells, and genetically engineered cells. Other topics include fermentation and biological mass transport processes. Prerequisites: CH 362 and 363.

561 Bioseparations, Recombinant Techniques And Protein Engineering  
General characteristics of separation processes used in the biotechnology industry including removal of insolubles, isolation and purification of thermally sensitive products for final use by the customer. Application of unit operation principles for biological separations, recombinant DNA techniques and protein engineering. Prerequisites: CH 362 and 363, CHE 560.

570 Mechanical Behavior of Engineering Materials  
Structure, properties, and behavior of materials. Structural defects and their influence on mechanical properties, point defects, dislocation and lattice imperfection in crystals, elastic deformation of single crystal and polycrystalline alloys, strengthening mechanisms and fracture. Strain rate, time to failure, and cyclic life from a microscopic viewpoint. Prerequisites: CHE 294, CE 370.

594 Applied Materials Engineering  
Synthesis and processing methods of materials for engineering applications. Selection and use of material performance factors for design of structural and functional components. Use of computational methods in solving open-ended design problems that depend on an understanding of the nature and properties of materials will be emphasized. All classes of materials are covered. Prerequisites: CHE 344 and either CH 342 or 348.

595 Polymer Engineering  

595 Polymer Engineering  
Application of classical thermodynamics. Treatment of problems involving nonideal gases and liquids, phase equilibrium, and chemical equilibrium. Prerequisite: CHE 344 (Same as MAE 641).

644 Introduction To Electrochemical Systems  
Thermodynamics, transport, and kinetics of electrodes and cells. Systems analysis of batteries, fuel cells, porous electrodes, electroplating, electrowinning, and corrosion processes. Convective diffusion at high Schmidt numbers. Prerequisites: CHE 443 or equivalent.

646 Thermodynamics Of Materials  
Treatment of thermodynamic topics as they apply to behaviors observed in metallic and non-metallic materials. Prerequisites: CH 341 or equivalent.
649 Transport Phenomenon (3 hrs)
Mass, energy, and momentum transport in steady and transient motions in real and rheological substances. Prerequisite: CHE 442 (Same as MAE 649).

652 Introduction To Air Pollution (3 hrs)
Technology of air pollution dealing with air pollutants, effects, sources, combustion processes, and abatement and control technology. Engineering contributions to both the problems and their solutions. Nature of air pollution problem and fundamental technological approaches to its solution. Prerequisite: graduate standing. Offered upon demand. (Same as CE 652.)

654 Multiphase Transport And Particulate Phenomena (3 hrs)
Fundamental principles of gas-liquid/gas solid flows, particle size analysis particle/droplet dispersion, pneumatic transfer, adhesion and agglomeration atomization and spray, jump conditions at interface, numerical solutions. Prerequisite: CHE/MAE 649.

657 Advanced Process Control (3 hrs)
Application of modern control theory to chemical processes; multivariable control; estimation and adaptive control, optimal control. Prerequisite: CHE 445 or ECE 505.

658 Catalysis And Reactor Design (3 hrs)
Treatment of homogeneous and heterogeneous reaction kinetics, transport in fluid-solid reactions, catalyst deactivation and their effects on the analysis and design of chemical reactors. Prerequisites: CHE 541.

659 Selected Topics In Chemical Engineering (Credit to be arranged)

699 MASTER'S THESIS (3 or 6 hrs)
Required each term in which student is working and receiving direction on the Master's thesis. A minimum of two terms and six hours is required for M.S.E. students. A maximum of nine hours of credit is awarded upon successful completion of Master's thesis.

747 Advanced Topics In Bioengineering (3 hrs)
Engineering aspects of microbial processes and the processing of biological materials. Integrating knowledge of governing biological properties and principles with chemical engineering methodology. Emphasis on current literature in the areas of purification and separation technology, bioprocess development and biomaterials. Prerequisite: B.S. in chemical engineering or permission of the instructor.

749 Mass Transport (3 hrs)
Mass transfer in solid and fluid systems under steady and transient conditions. Integration of momentum, heat and mass transfer equations with application to reactive, rheological and multicomponent systems. Prerequisites: MAE 643, 651 (Same as MAE 749).
757 Optical Techniques In Fluid Mechanics (3 hrs)
Laser courses, molecular interactions with light and diatomic spectroscopy needed fluorescence, Brillouin scattering, four wave mixing, CARS and other applications in optical fluid diagnostics. Prerequisites: EE 542 (Same as MAE 757)

799 Doctoral Dissertation (3 or 6 hrs)
BASIC GRADUATE COURSES GROUPED BY DISCIPLINE

All MSE Plan I (Thesis) and Plan II (Non-thesis) students must take MAE 671 as part of their graduate program. All MSE students must have a 6 hour Math minor. MAE 671 can be applied toward 3 of the 6 hours.

All MSASE and Plan I (Thesis) and Plan II (Non-Thesis), and Ph.D. ASE students must take MAE 692, ISE 601 and ISE 627.

The following listings are suggested courses in discipline areas along with faculty members with teaching and research interests in these areas.

AVIATION SYSTEMS (Landrum, Slegers, Componation)

MAE 594 Aircraft Design
MAE 631 Rotorcraft Design I
MAE 632 Rotorcraft Design II
MAE 657 Helicopter Theory
MAE 680 Performance Flight Testing
MAE 684 Aerospace Systems Seminar
ISE 601 Intro to Probability and Statistics for Engineers
ISE 627 Engineering Systems
ISE 638 Reliability Engineering

MISSILE SYSTEMS (Frederick, Landrum, Slegers, Componation)

MAE 568 Elements of Spacecraft Design
MAE 593 Rocket Design
MAE 633 Tactical Missile Design I
MAE 634 Tactical Missile Design II
MAE 681 Missile Trajectory Analysis
MAE 684 Aerospace Systems Seminar
MAE 755 Advanced Aerodynamics
ISE 601 Intro to Probability and Statistics for Engineers
ISE 627 Engineering Systems
ISE 638 Reliability Engineering

AERODYNAMICS (Cassibry, Landrum, Rani)

MAE 520 Compressible Fluid Mechanics
MAE 530 Fundamentals of Aerodynamics
MAE 580 Aircraft Stability and Control
MAE 651 Viscous Fluid Mechanics
MAE 657 Helicopter Theory
MAE 754 Hypersonic Flow
MAE 755 Advanced Aerodynamics
MAE 758 Turbulence
MAE 780 Theory of Acoustics

MATERIALS AND SOLID MECHANICS (Evans, Gilbert, Karbhari, Lin, Wang, Zuo)
MAE/CE 574 Applied Mechanics of Solids
MAE/CE 577 Fundamentals of Experimental Mechanics
MAE/CE 671 Continuum Mechanics
MAE/CE 672 Elasticity
MAE/CE 673 Plasticity
MAE/CE 676 Viscoelasticity
MAE/CE 677 Optical Techniques in Solid Mechanics
MAE/CE 678 Mechanics of Composite Materials
MAE/CE 772 Theory of Structural Stability
MAE/CE 773 Theory of Shells
MAE/CE 778 Fracture Mechanics

DYNAMICS AND VIBRATION (Lin, Slegers, Wallace, Fahimi, Wang)
MAE/CE 561 Vibration of Elastic Systems
MAE 563 Intermediate Dynamics
MAE/CE 660 Structural Dynamics
MAE 661 Advanced Dynamics
MAE 663 Astrodynamics
MAE 760 Analytical Methods in Nonlinear Dynamics
MAE/CE 762 Wave Motion of Continuous Elastic Bodies
MAE/CE 765 Random Vibration of Elastic Systems
MAE 768 Dynamics of Aerospace Vehicles

STRUCTURAL ANALYSIS (Evans, Gilbert, Lin, Zuo, Wang)
MAE/CE 660 Structural Dynamics
MAE 661 Advanced Dynamics
MAE/CE 671 Continuum Mechanics
MAE/CE 674 Finite Element Analysis I
MAE 678 Mechanics of Composite Materials

STABILITY AND CONTROL (Slegers, Fahimi)
ECE 505 Introduction to Control and Robotic Systems
MAE 580 Aircraft Stability and Control
ECE 605 Classical Control Design
CHE 657 Advanced Process Control
MAE 681 Missile Trajectory Analysis
ECE 701 Advanced Linear Control Theory
ECE 704 Nonlinear Control Systems
ECE 705 Theory of Optimal Control
MAE/CE 772 Theory of Structural Stability
## FLUID MECHANICS (Cassibry, Frendi, Hollingsworth, Mahalingam, Shotorban, Rani)

<table>
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<tr>
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<th>Course Title</th>
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<tr>
<td>MAE 520</td>
<td>Compressible Fluid Mechanics</td>
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<td>MAE 531</td>
<td>Introduction to Plasma Dynamics</td>
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<td>CHE 540</td>
<td>Physical Properties of Fluids</td>
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<tr>
<td>CHE/CE 549</td>
<td>Introduction to Environmental Engineer</td>
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<td>MAE 651</td>
<td>Viscous Fluid Mechanics</td>
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<td>CHE/CE 652</td>
<td>Introduction to Air Pollution</td>
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<td>MAE 623</td>
<td>Computational Fluid Dynamics I</td>
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<tr>
<td>CHE 658</td>
<td>Catalysis and Reactor Design</td>
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<td>MAE/CE 671</td>
<td>Continuum Mechanics</td>
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<td>MAE 723</td>
<td>Computational Fluid Dynamics II</td>
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<td>MAE 724</td>
<td>Computational Fluid Dynamics III</td>
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<td>Mechanics of Rarified Gases</td>
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<td>Magneto-gas Dynamics</td>
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<td>MAE 781</td>
<td>Nonlinear Effects in Plasma</td>
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<td>MAE 782</td>
<td>Plasma Turbulence</td>
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<td>PH 531</td>
<td>Introduction to Plasma Dynamics</td>
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## HEAT TRANSFER AND THERMODYNAMICS (Blackmon, Cassibry, Hollingsworth, Rani, Wessling)

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<tr>
<td>CHE 541</td>
<td>Chemical Kinematics and Reactor Design</td>
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<td>MAE 545</td>
<td>Heat Distribution Systems Design</td>
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<td>MAE 546</td>
<td>Solar Energy Systems</td>
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<tr>
<td>MAE 548</td>
<td>Energy Conversion and Power Generation</td>
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<tr>
<td>CHE/CE 549</td>
<td>Introduction to Environmental Engineering</td>
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<tr>
<td>MAE/CHE 641</td>
<td>Advanced Thermodynamics</td>
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<tr>
<td>MAE 643</td>
<td>Advanced Heat and Mass Transfer</td>
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<tr>
<td>CHE 644</td>
<td>Introduction to Electrochemical Systems</td>
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<td>CHE 646</td>
<td>Thermodynamics of Materials</td>
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<td>MAE/CHE 649</td>
<td>Transport Phenomena</td>
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<td>CHE 657</td>
<td>Advanced Process Control</td>
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<td>MAE 748</td>
<td>Radiative Transfer</td>
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<td>MAE/CHE 749</td>
<td>Mass Transport</td>
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PROPULSION AND COMBUSTION (Blackmon, Cassibry, Frederick, Frendi, Rani, Shotorban)

MAE  520  Compressible Fluid Mechanics
MAE  541  Airbreathing Propulsion
MAE  640  Rocket Propulsion II
MAE  651  Viscous Fluid Mechanics
MAE/CE 671  Continuum Mechanics
MAE  645  Combustion I
MAE  745  Combustion II

NUMERICAL METHODS AND ENGINEERING ANALYSIS (Frendi, Lin, Rani, Shotorban, Wallace)

MAE  585  Numerical Methods and Engineering Computation III
MAE  589  Computer Aided Engineering
MAE  623  Computational Fluid Dynamics I
MAE  647  Uncertainty Analysis in Experimentation
MAE/CE 671  Continuum Mechanics
MAE/CE 674  Finite Element Analysis I
MAE  692  Graduate Engineering Analysis I
MAE  693  Graduate Engineering Analysis II
MAE  723  Computational Fluid Dynamics II
MAE  724  Computational Fluid Dynamics III
MAE  774  Finite Element Analysis II

CHEMICAL (Banish, Cerro, Chen, Chittur, Smith, Weimer)

CHE  540  Physical Properties of Fluids
CHE  541  Chemical Kinetics And Reactor Design
CHE  549  Introduction To Environmental Engineering
CHE  550  Environmental Control
CHE  559  Selected Topics in Chemical Engineering
CHE  560  Introduction to Bioprocess Engineering
CHE  561  Bioseparations, Recombinant Techniques And Protein Engineering
CHE  570  Mechanical Behavior of Engineering Materials
CHE  594  Applied Materials Engineering
CHE  595  Polymer Engineering
CHE  595  Polymer Engineering
CHE  644  Introduction To Electrochemical Systems
CHE  646  Thermodynamics Of Materials
CHE  649  Transport Phenomenon
CHE  652  Introduction To Air Pollution
CHE  654  Multiphase Transport And Particulate Phenomena
CHE  657  Advanced Process Control
CHE  658  Catalysis And Reactor Design
CHE  659  Selected Topics In Chemical Engineering
CHE  747  Advanced Topics In Bioengineering
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<tr>
<td>CHE</td>
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<td>Mass Transport</td>
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<tr>
<td>CHE</td>
<td>757</td>
<td>Optical Techniques In Fluid Mechanics</td>
</tr>
</tbody>
</table>
MASTER’S AND Ph.D. STUDENTS DATES & DEADLINES
http://www.uah.edu/graduate/admissions/admission-dates

SPRING
Application to Graduate: February 1
Oral Defense: March 1
Submission of Thesis: March 15
Submission of Dissertation: April 1
Non-Thesis Final Oral Exam: April 15

SUMMER
Application to Graduate: June 1
Oral Defense: June 15
Submission of Thesis: June 30
Submission of Dissertation: June 30
Non-Thesis Final Oral Exam: July 15

FALL
Application to Graduate: September 1
Oral Defense: October 15
Submission of Thesis: November 1
Submission of Dissertation: November 1
Non-Thesis Final Oral Exam: November 15

Thesis/Dissertation must be approved (signed) by committee, department/program chair, college dean and submitted to Graduate Studies by the POSTED date.

Dates falling on Saturday or Sunday will be extended to the following Monday
FORMS

Applications and Admissions
http://www.uah.edu/graduate/admissions/application
MSE and Ph.D. program Admission
Non-degree Application

Change to Programs of Study & Applications for Degree/Certificate
http://www.uah.edu/graduate/resources/forms
Change to Program of Study
Application for Advanced Degree

Examinations
http://www.uah.edu/graduate/resources/forms
Notification of Oral Exam/Defense
Report of Oral Examination Committee
Report of Ph.D. Preliminary Examination

Other
http://www.uah.edu/graduate/resources/forms
Change to Graduate Supervisory Committee

MAE Department Programs of Study
Program of Study for Masters Degrees (MSE and MSASE)
Program of Study for Doctoral Degrees (ME and ASE)

Other MAE Department Specific Forms
Graduate Student Information
Validation of Courses Beyond Six Year Limit
Certification of MSE Non-thesis Presentation
Preliminary Exam Waiver
THE UNIVERSITY OF ALABAMA IN HUNTSVILLE  
School of Graduate Studies  
PROGRAM OF STUDY FOR MASTER'S DEGREE

Name: ___________________________  All: ________________  
Address: ___________________________________________  Telephone: ________________________________  
Department/Program: Mechanical & Aerospace Engineering  Degree: MSE  Thesis ☑  Non-Thesis ☐

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<th>Course</th>
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<td></td>
<td><strong>FIRST MINOR</strong> (AREA OF SPECIALIZATION, 6 hrs.)</td>
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<td><strong>SECOND MINOR</strong> (MATH, 6 hrs.)</td>
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*Copy of transcript must accompany transfer request

Approval Signatures:  
Supervisory Committee Signatures

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<tr>
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<td>Date</td>
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<tr>
<td>Department Chair</td>
<td>Date</td>
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<tr>
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<td>Date</td>
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<tr>
<td>Chair</td>
<td>Date</td>
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<tr>
<td>Thesis Advisor (if other than Committee Chair)</td>
<td>Date</td>
<td></td>
</tr>
</tbody>
</table>

Member Date  
Member Date

Indicate course waivers, substitutions or other comments pertinent to a graduation audit:

55
# PROGRAM OF STUDY FOR MASTER'S DEGREE

**Name:**

**Address:**

**Department/Program:** Mechanical & Aerospace Engineering

**Degree:** MSE

**Telephone:**

### Required Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<th>Grade</th>
<th>Term</th>
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<th>Name of Institution if transfer course request*; remarks; Transfer Course #</th>
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**Thesis Courses applicable [✓] not applicable [ ]**

**ESL required [ ] not required [✓]**

*Copy of transcript must accompany transfer request*

---

**Approval Signatures:**

**Supervisory Committee Signatures**

**Student Date**

**Chair Date**

**Department Chair Date**

**Thesis Advisor (if other than Committee Chair) Date**

**Interim Dean, Graduate Studies Date**

---

**Indicate course waivers, substitutions or other comments pertinent to a graduation audit:**

---

56
Name: A#
Address: Telephone:
Department/Program: Mechanical & Aerospace Engineering Degree: MSASE Thesis [ ] Non-Thesis [ ]

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<th>Title</th>
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*Copy of transcript must accompany transfer request

Approval Signatures: Supervisory Committee Signatures

Student Date Chair Date
Department Chair Date Thesis Advisor (if other than Committee Chair) Date
Interim Dean, Graduate Studies Date Member Date

Member Date

Indicate course waivers, substitutions or other comments pertinent to a graduation audit:
THE UNIVERSITY OF ALABAMA IN HUNTSVILLE
School of Graduate Studies
PROGRAM OF STUDY FOR MASTER'S DEGREE

Name:   A#   Address:  Telephone: 
Department/Program: Mechanical & Aerospace Engineering  Degree: MSASE  Thesis  Non-Thesis

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<th>Grade</th>
<th>Term</th>
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</table>

Thesis Courses applicable ☑  not applicable ☒

ESL required ☑  not required ☒

*Copy of transcript must accompany transfer request

Approval Signatures:  Supervisory Committee Signatures

Student Date  Chair Date
Department Chair Date  Thesis Advisor (if other than Committee Chair) Date
Interim Dean, Graduate Studies Date

Indicate course waivers, substitutions or other comments pertinent to a graduation audit:

58
THE UNIVERSITY OF ALABAMA IN HUNTSVILLE  
School of Graduate Studies  
PROGRAM OF STUDY FOR Ph.D. in MECHANICAL ENGINEERING DEGREE  

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<th>Term</th>
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Students with UAH MSE or MSASE can include 1 credit MAE 683/684 and up to 9 hours of MAE 699

Dissertation Courses (minimum 18 hours)

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**First Minor** (AREA OF SPECIALIZATION, 12 hours)

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**Second Minor** (Math, 9 hours)

- MAE 692 Graduate Engineering Analysis I

**ESL Courses** (if applicable)

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**Foreign Language/Ancillary Skills** (if applicable)

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**Approval Signatures:**

- Student: (type name here)  Date: 

- Comm. Chair: (type name here)  Date: 

- Interim Department Chair:  Date: 

- Interim Dean, Graduate Studies:  Date: 

**Supervisory Committee Signatures:**

- Advisor: (if other than Comm. Chair)  Date: 

- Member: (type name here)  Date: 

- Member: (type name here)  Date: 

- Member: (type name here)  Date: 

- Member: (type name here)  Date: 

- Member: (type name here)  Date: 

**ESL Courses** (if applicable)

- Distribution: Department
- Student: (type name here)
THE UNIVERSITY OF ALABAMA IN HUNTSVILLE
School of Graduate Studies

PROGRAM OF STUDY FOR Ph.D. in AEROSPACE SYSTEMS ENGINEERING DEGREE

Name: (type name here) A#
Address: Phone

Department or Program: Mechanical & Aerospace Engineering
First Minor: Second Minor: 

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Students with UAH MSE or MSASE can include 1 credit MAE 683/684 and up to 9 hours of MAE 699

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<th>Dissertation Courses (minimum 18 hours)</th>
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Ph.D. ASE, Continued

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<td>ISE 601 Probability &amp; Statistics for Engineers</td>
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<table>
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<td>Interim Department Chair Date</td>
<td>Advisor: (if other than Comm. Chair) Date</td>
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<td>Interim Dean, Graduate Studies Date</td>
<td>Member: (type name here) Date</td>
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<th>Distribution Department Student</th>
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We appreciate your application for graduate studies in Mechanical and Aerospace Engineering at UAH. In order to complete your application review, please fill in this form and return it by email to mae@uah.edu.

Contact Information:
Name     
email     
Phone     
Starting Semester

Desired Degree and Major (check all that apply):
_____ MS with/thesis in _______ Mechanical or _______ Aerospace Systems
_____ MS non-thesis in _______ Mechanical or _______ Aerospace Systems
_____ PhD in _______ Mechanical or _______ Aerospace Systems or _______ Chemical

Status:
Will you be a _______ full-time or _______ part-time student?

Financial Support (check all that apply):
_______ Research Assistantship (RA) and/or _______ Teaching Assistantship (TA)

Technical Discipline (indicate first choice by 1 and, if applicable, second choice by 2):
_____ Materials & Solid Mechanics
_____ Structural Analysis

_____ Dynamics and Vibrations
_____ Stability and Control

_____ Fluid Mechanics
_____ Aerodynamics

_____ Heat Transfer and Thermodynamics
_____ Propulsion and Combustion

_____ Aviation Systems Engineering
_____ Missile Systems Engineering

_____ Numerical Methods & Analysis (includes CFD)
_____ Other:
VALIDATION OF COURSES BEYOND SIX YEAR LIMIT

Department of Mechanical & Aerospace Engineering
The University of Alabama in Huntsville

Student Name: _____________________________________ A#: __________________

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<thead>
<tr>
<th>Course No.</th>
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The courses listed above have been validated in accordance with the policy of the Mechanical and Aerospace Engineering Department.

Graduate Program Committee Chair: __________________________ Date ______________

(This is to be retained in the permanent student file)
THE UNIVERSITY OF ALABAMA IN HUNTSVILLE
Mechanical & Aerospace Engineering

CERTIFICATION OF MSE NON-THESIS PRESENTATION

The MAE Graduate Handbook requires all Plan II Non-thesis students to make an oral technical presentation in MAE 683 to satisfy requirements for their Final Comprehensive Examination.

TO: Chair, Mechanical & Aerospace Engineering

I confirm that:

(name) ___________________________ SID # ____________
Department/Program Mechanical & Aerospace Engineering

made an acceptable technical presentation on date: ____________

This examination was the first [ ] / [ ] second attempt by the student.

Signature: __________________________________________

Name: ____________________________________________

MAE 683 - Graduate Seminar Instructor

Form to be submitted to the Department of Mechanical and Aerospace Engineering.

(Distribution: Department)

(This is to be retained in the permanent student file)
THE UNIVERSITY OF ALABAMA IN HUNTSVILLE
Mechanical & Aerospace Engineering
Preliminary Exam Waiver
(Thesis Option Only)

Name ________________________________ A # __________

Dept./Program: Mechanical & Aerospace Engineering

☐ Master’s (Thesis) Defense Passed
☐ GPA ≥ 3.50

By signing below, Committee Chair/Advisor recommends approval of the Preliminary Exam Waiver.

_____________________________ Date _______________________________
Committee Chair/Advisor

☐ Graduate Committee Recommends Preliminary Exam Waiver
☐ Graduate Committee Does Not Recommend Preliminary Exam Waiver

_____________________________ Date _______________________________
Graduate Committee Chair

☐ Department Chair Approves Preliminary Exam Waiver
☐ Department Chair Does Not Approve Preliminary Exam Waiver

_____________________________ Date _______________________________
Department Chair

Preliminary Exam Waiver Form, rev. 2.14.2011