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The Mechanical and Aerospace Engineering Program Options

- Master of Science (MS)—non-thesis
- Master of Science (MS)—thesis option
- Masters in Passing (MIP)
- Doctor of Philosophy (PhD)
- Doctor of Philosophy with an Engineering Education concentration (PhD)

All of the programs stress a sound foundation in technical fundamentals, communication and professionalism. The MS degree programs prepare engineers for doctoral study or industrial positions that specialize in research, project management and product innovation. The doctoral programs emphasize original research and provide students with a strong background for employment by academic institutions, government laboratories and industrial research laboratories. SEMTE offers a broad-based curriculum in design, system dynamics and control; fluid mechanics science and engineering; mechanics and dynamics of solids and structures; and transport phenomena, thermodynamics, and energy. Modern computational and laboratory facilities are available to support timely research investigations. The following sections provide information about program requirements, policies, and curricula.

Graduate Courses
Graduate course offerings in the School cover the classical areas, including aerodynamics and fluid mechanics, design and manufacturing, heat transfer and thermodynamics, solid mechanics and dynamics, and system dynamics and control as well as interdisciplinary topics. A list of current course offerings in these areas is given in Appendix A.

Graduate College Policies

The Graduate College has final approval of all plans of study and is responsible for the conferral of all graduate degrees. Students are thus responsible for reading, understanding, and abiding by all of the policies found in the Graduate College Handbook: http://graduate.asu.edu/sites/default/files/Grad_Policies.pdf as well as all SEMTE policies as described herein.

Plan of Study

Students are able to submit a Plan of Study from the first day of their graduate studies. The Plan of Study (iPOS) is an interactive web based form that graduate students complete and which outlines all coursework required to obtain their degree. Master’s students are expected to complete the iPOS in their first semester and no later than their second semester. Doctoral students should file the iPOS no later than their second semester.

All SEMTE graduate students are required to submit and have their Plan of Study (iPOS) approved prior to being eligible for registration of their third semester classes. Thus students are expected to use of their first semester in the program to know faculty, selecting a faculty advisor, and creating their Plan of Study to demonstrate their intended path to graduate from
the program. The faculty chair must approve the iPOS. It is the student’s responsibility to ensure that the transcript and the iPOS are synchronized through a course change, to obtain the program faculty chair’s approval of any changes, and to submit all documentation to the SEMTE Graduate Academic Advising Office.

Audited courses do not apply toward the degree program and cannot be listed on the iPOS. In general SEMTE graduate students are not granted permission to audit a course until the student has filed a Plan of Study (iPOS) and has completed all coursework on the iPOS. Special requests to audit courses must be submitted to the Graduate Program Chair after approval by the faculty chair.

Program Policy on Maximum Course Load

Per the Graduate College, registration in nine credits is considered a full-time load for graduate students. Students who are a part of the Ira A. Fulton Schools for Engineering are restricted to a maximum of 12 credits per semester. Exceptions to register for more than 12 credits require the approval of both program committee chair and Graduate Program chair.

Graduate Student Advising

The initial advising of all incoming students is carried out by the SEMTE Graduate Academic Advising Office and the Graduate Program Chair unless a faculty advisor has been arranged prior to the student’s (PhD or MS with thesis) arrival to ASU. Throughout the student’s graduate program, the SEMTE Graduate Academic Advising Office can assist with the process towards completing the degree (i.e. registration, iPOS questions), but not with academic content. Questions involving academic content should be directed to either the faculty chair or the Graduate Program Chair.

Professionalism and Honor Code

Ethics and professional conduct are cornerstones of the Engineering profession and graduate students are fully expected to adhere to these expectations. Ethical violations (e.g. “cheating”) and unprofessional conduct with regards to faculty and staff will not be tolerated. ASU has approved an Honor Code to which the students have to adhere.

Master of Science (MS)—non-thesis option

The MS—non-thesis degree is the default master’s degree in Aerospace Engineering and Mechanical Engineering and two tracks are available:

- MS—non-thesis/portfolio
- MS—non-thesis/applied project

The degree requires completion of 30 credit hours (see checksheet at the end of this Handbook) and consists of the following:

- At least fifteen (15) credit hours of graduate MAE coursework (500 level and above). Graduate non-MAE courses may be substituted, upon approval by the MAE Graduate Program Chair.
• At least six (6) credit hours of graduate mathematics-oriented courses (500 level and above). Students often take MAE 501 Linear Algebra in Engineering and MAE 502 Partial Differential Equations in Engineering but many other courses are acceptable, see list in Appendix A. Note that any MAE courses, such as MAE 501 and MAE 502, that are counted as mathematics-oriented courses cannot be “double-counted” towards the fifteen (15) credit hours of graduate MAE coursework.

• At least nine (9) credit hours of additional graduate courses; these may be either MAE or non-MAE courses, and are not restricted to science, mathematics, or engineering. A maximum of three (3) credit hours of MAE 584 Internship may be counted towards this requirement. A combined maximum of six (6) credit hours of MAE 591 Seminar, MAE 594 Graduate Research Conference, or MAE colloquium classes may be counted towards this requirement. For students carrying out an applied project, a maximum of six (6) credit hours of MAE 593 Applied Project can count towards this requirement.

Note: MS—non-thesis students carrying out an applied project must include at least 3 credit hours of MAE 593 Applied Project on their iPOS. MAE 593 Applied Project is normally taken during the final semester of study. A typical applied project is expected to count for 3 hours. Requests for 6 hours of applied project are allowed must be approved in advance by the Graduate Program Chair.

• International students in SEMTE programs are ineligible for Curricular Practical Training (CPT)

• A minimum cumulative grade point average of 3.00 is required on both transcript and iPOS.

Applied Project

The applied project is carried out under the supervision of a faculty member, typically a member of the MAE graduate faculty https://graduate.asu.edu/graduate_faculty although other ASU faculty members may be selected upon approval by the Graduate Program Chair. Students desiring to conduct an applied project must first obtain the approval of a faculty member to work with them on the project. They must then request the approval of the Graduate Program Chair. At completion of the applied project, the students must prepare a written report delivered to the faculty advisor of the project and deliver a short oral presentation to the faculty advisor. Credit is earned when the faculty advisor approves the written report and oral presentation.

For students carrying out an applied project, the faculty chair is the faculty advisor for the project. The applied project committee consists only of the faculty chair.

Portfolio

The Portfolio is a sample of the significant projects that a graduate student has carried out during his/her graduate studies showcasing the quality of the graduate education he/she has received. Students choosing the MS portfolio option must select two significant projects from
previously completed graduate MAE or Math coursework listed on their approved iPOS. The portfolio is then the concentration of the reports (presentation slides are acceptable if no report was submitted for that project) submitted to the instructors of the two selected graduate classes. A cover page needs to be included describing what courses the projects were carried out in, and why they were selected for inclusion in the Portfolio by the student. The Graduate Program Chair will be solely responsible for judging the quality of the portfolio and determining if it is satisfactory to serve as the required culminating event for the MS—non-thesis degree. For students selecting the portfolio option, the committee consists only of the Graduate Program Chair serving as faculty chair.

**Timeline**

i) File Plan of Study – prior to beginning of second semester of study (Spring or Fall only, not counting summer)

ii) Select applied project option or portfolio option. If selecting the applied project option, the student must first identify a faculty member to supervise the project, see above

iii) Apply for graduation – please see the Academic Calendar for deadlines at: [http://students.asu.edu/academic-calendar](http://students.asu.edu/academic-calendar)

iv) For students carrying out an applied project, submit a completed “Schedule Defense Room Reservation Form” to the SEMTE Graduate Advising Office 15 working days prior to the expected project presentation date.

v) Present the results of the applied project or submit the portfolio, normally due the day before reading day (the day between the end of classes and the start of final exams).

vi) Commencement date – See academic calendar

**Master of Science (MS)—thesis option**

The MS—thesis option is the School's research master's degree. A member of the ME or AE Graduate Faculty (with co-chair or chair status as specified on the web site) must agree to serve as the program committee chair (faculty advisor) for a student to be transferred to the MS—thesis degree program. The SEMTE Graduate Academic Advising Office will need to have confirmation in writing (email is acceptable) from the faculty member agreeing to serve as the thesis chair prior to a plan change being made to move to the MS—thesis degree. The program committee chair, in consultation with the student, will establish a Program Committee. It shall be composed of a minimum of three members from the ASU faculty with at least two being from the ME or AE Graduate Faculty. If the program committee chair has chair status as Graduate Faculty, the remaining two members must have at least member status or be approved by the Graduate Program Chair and Graduate College. If the program committee chair has co-chair status, the program committee must include a faculty member with chair status serving as second co-chair. The remaining member(s) must have at least member status or be approved by the Graduate Program Chair and Graduate College. Participation of individuals from institutions external to ASU is encouraged but may be non-voting members at the discretion of the MAE Graduate Program Chair and must be approved by the Graduate Program Chair and the Graduate College.
The 30 credit hours consist of the following (see checksheet at the end of this Handbook):

- At least twelve (12) credit hours of graduate MAE coursework (500 level and above). Graduate non-MAE courses may be substituted, upon approval by the MAE Graduate Program Chair.

- At least six (6) credit hours of graduate mathematics-oriented courses (500 level and above). Students often take MAE 501 Linear Algebra in Engineering and MAE 502 Partial Differential Equations in Engineering but many other courses are acceptable, see list in Appendix A. Note that any MAE courses, such as MAE 501 and MAE 502, that are counted as mathematics-oriented courses cannot be “double-counted” towards the twelve (12) credit hours of graduate MAE coursework.

- At least six (6) credit hours of additional graduate courses; these may be either MAE or non-MAE courses, and are not restricted to science, mathematics, or engineering. A maximum of three (3) credit hours of MAE 584 Internship may be counted towards this requirement. A combined maximum of six (6) credit hours of MAE 591 Seminar, or MAE colloquium classes may be counted towards this requirement.

- Six (6) hours of MAE 599 Thesis is required. A final public defense of the thesis will be administered by the committee.

- A minimum cumulative grade point average of 3.00 is required on both transcript and iPOS.

**Timeline**

i) Identify a thesis advisor from the ME or AE Graduate Faculty. This should be done as soon as possible, but no later than the second semester of study.

ii) File Plan of Study – prior to beginning of second semester of study (Spring or Fall only, not counting the summer).

vii) Apply for graduation – please see the Academic Calendar for deadlines at: [http://students.asu.edu/academic-calendar](http://students.asu.edu/academic-calendar)

iii) Submit a completed “Schedule Defense Room Reservation Form” to the SEMTE Graduate Advising Office 15 working days prior to the defense to reserve a room. The Room Reservation Form is online and may be found here: [https://docs.google.com/a/asu.edu/forms/d/1grlxdpJQgaK1NE5l4oHFXW7S2561jtcG5pI7HTbFF0/viewform?usp=send_form](https://docs.google.com/a/asu.edu/forms/d/1grlxdpJQgaK1NE5l4oHFXW7S2561jtcG5pI7HTbFF0/viewform?usp=send_form)

iv) Schedule the defense with the Graduate College through the MyASU portal a minimum of ten business days (not including holidays) before defense date (consult 10-day calendar).

v) Submit thesis for format approval – please see the Graduate College deadlines and procedures for additional information: [http://graduate.asu.edu/graddeadlines.html](http://graduate.asu.edu/graddeadlines.html)

vi) Submit thesis title, date/time/location of defense, and abstract to the SEMTE Graduate Academic Advising Office for internal posting.

vii) Hold oral defense of thesis – must be completed by the last day to defend a thesis date as defined in [http://graduate.asu.edu/graddeadlines.html](http://graduate.asu.edu/graddeadlines.html)

viii) Submit pass/fail form to the Graduate College and a copy to the SEMTE Graduate Academic Advising Office.
ix) Submit thesis to ProQuest electronically when directed by the Graduate College.
x) Commencement date – See academic calendar.
**Doctor of Philosophy (PhD) Program**

The Doctor of Philosophy (PhD) degree is directed toward original research. The student is required to write and defend a dissertation that describes an original contribution within the chosen discipline. The research results should be suitable for publication in a reputable, scholarly journal. The School currently offers majors in Aerospace Engineering, Aerospace Engineering (Engineering Education), Mechanical Engineering, and Mechanical Engineering (Engineering Education). PhD students must pass a Qualifying Exam, a Comprehensive Exam, successfully present their Dissertation Prospectus, and successfully defend their Dissertation, as described below.

**Selection of a PhD Faculty Advisor**

The student must select a faculty advisor (with co-chair or chair status as specified on the web site) who agrees to serve and will become the faculty chair. This process must be completed prior to the student enrolling for the third semester. The faculty chair’s name must be filed with the SEMTE Graduate Academic Advising Office through the filing of the Plan of Study (iPOS) on the MyASU portal. A change of faculty chair requires approval of the MAE Graduate Program Chair.

**PhD Program Committee**

University regulations note the possibility of having two separate supervisory committees—A Program Committee and a Dissertation Committee. In the MAE programs these will normally be one and the same and will be designated as the Program Committee (PC).

The faculty chair, in consultation with the student, will establish a PC, the purposes of which are to:

1) Approve the plan of study (iPOS)
2) Provide guidance for the student's research
3) Administer the qualifying and comprehensive examinations (in the new guidelines)
4) Administer the dissertation defense

The PC shall consist of at least five ASU faculty members with the majority being from the MAE Faculty, but at least one being from outside the MAE. If the faculty chair has chair status as Graduate Faculty, the remaining members must have at least member status or be approved by the Graduate Program Chair and Graduate College. If the faculty chair has co-chair status, the program committee must include a faculty member with chair or co-chair status serving as second co-chair. The remaining members must have at least member status or be approved by the Graduate Program Chair and Graduate College.
Participation of individuals from institutions external to ASU is encouraged, but these may be non-voting members as determined at the discretion of the MAE Graduate Program Chair and must be approved by the Graduate Program Chair and the Graduate College.

**PhD Plan of Study (iPOS)**

- The student in consultation with his/her PC chair and the PC must file an iPOS prior to enrolling for the third semester. The iPOS must meet general University requirements including the need for rigorous fundamental knowledge of engineering principles. Candidates for the PhD degree must complete a minimum of 84 semester hours of course and dissertation work distributed below. Thirty (30) credit hours of appropriate coursework from a previously earned master’s degree may be applied toward the total credit hours; at least fifty-four (54) hours must be taken at Arizona State University. A minimum cumulative grade point average of 3.25 is required on both transcript and iPOS.

The 84 credit hours consist of the following (see checksheet at the end of this Handbook)

- At least twelve (12) credit hours of graduate MAE coursework (500 level and above) must be taken at ASU. These 12 credit hours may not include MAE 584 Internship, MAE 590 Reading and Conference, MAE 591 Seminar but rather must be regular graduate-level MAE courses.
- A maximum of two 400-level (undergraduate) courses (6 credit hours) may be taken towards the major, minor, or math requirements. These 400-level courses must be non-MAE courses.
- MAE 584 Internship, MAE 590 Reading and Conference, MAE 591 Seminar, and MAE 792 Research may be applied toward the 84 total hours, although not towards the major, minor, and math requirements.
- Twelve (12) hours of MAE 799 Dissertation must be taken and applied towards the 84 credit hour requirement.
- At least eighteen (18) credit hours of coursework directly related to the research area referred to here as the major
- At least nine (9) credit hours of coursework outside the major research area; these are restricted to mathematics, engineering and/or science unless approved by the Graduate Program Chair and are referred to here as the minor.
- At least nine (9) credit hours of mathematics-oriented coursework. Students often take MAE 501 Linear Algebra in Engineering and MAE 502 Partial Differential Equations in Engineering towards these requirements but many other courses are acceptable, see list in Appendix A. Note that any MAE courses, such as MAE 501
and MAE 502, that are counted as mathematics-oriented courses cannot be “double-counted” towards the other required MAE coursework.

Note: The faculty Chair must approve the iPOS

PhD Qualifying Exam

A graduate student pursuing a PhD program of study in Aerospace or Mechanical Engineering must pass a qualifying exam, as described below:

- Oral examination carried out by the program committee on basic subject matter relevant to the student’s research, as defined by the program committee
- The student will not make a presentation, but rather will answer questions from the qualifying committee.
- The student is responsible for scheduling the qualifying exam in consultation with the program committee.
- The qualifying exam must be taken and passed within 18 months of starting the PhD degree for students entering with a Master’s degree, and within 36 months of starting the PhD degree for students entering with only a Bachelor’s degree.
- Student will have one opportunity to retake the qualifying exam, in the event of failure. The attempt to re-take the exam must be completed within 24 months of starting the PhD degree, for students entering with a Master’s degree, and within 42 months of starting the PhD degree, for students entering with only a Bachelor’s degree.

PhD Comprehensive Examination and Dissertation Proposal Prospectus

All students intending to earn the PhD degree are required to pass a comprehensive examination. The examination will be administered by the PC. The student must prepare a written dissertation prospectus describing in details the research carried out by him/her up to that point and the research plan to be followed until completion of the dissertation. It must be submitted to the PC well enough in advance of the examination to allow the program committee to read it in details. The prospectus is considered as the written component of the comprehensive exam.

During the examination, the student will orally defend the prospectus to the PC and answer questions related to it. This is considered both as the oral component of the comprehensive exam and as the doctoral dissertation prospectus defense. It is the student’s responsibility to bring the required forms (Report of Doctoral Comprehensive Exams and Results of Doctoral Dissertation Proposal/Prospectus) to the defense and then to the SEMTE Graduate Academic Advising Office for School processing. The forms may be found at: http://engineering.asu.edu/semte/GradForms.html.

The comprehensive examination is taken after completing the PhD qualifying exam. The comprehensive exam must be taken within 12 months after passing the qualifying exam. Part-time students should apprise the Graduate Program Chair of a timely schedule for exam completion. Students who do not take the comprehensive exam by this deadline will be
Considered as not making satisfactory academic progress and may be recommended for removal from the program.

**Masters in Passing (MIP)**
Students who are enrolled in the Mechanical or Aerospace Engineering PhD program and who do not have a previously earned MS degree may apply for a Masters in Passing (MIP) upon completion of 30 hours of appropriate graduate coursework and successful passing of the comprehensive exam. The MIP requires a separate iPOS from the PhD and all grades must be entered before the MIP can be awarded. Contact the SEMTE Graduate Academic Advising Office for additional information.

**PhD Candidacy**
PhD students achieve candidacy status in a letter from the Graduate College Dean upon passing the comprehensive examination and successfully defending the dissertation prospectus with an approved iPOS on file. This is sent directly from the Graduate College and is found in the MyASU system.

**PhD Dissertation Defense**
The dissertation defense is an oral and public examination administered by the PC in accordance with Graduate College guidelines. The purpose of the examination is to evaluate the student's research efforts and written presentation (dissertation), and to determine if the candidate is worthy of receiving a PhD degree. The emphasis of this examination is on the student's research as detailed in the dissertation and the general areas of study related to it. The final dissertation defense must be taken within five years of passing the comprehensive examination. It is the student’s responsibility to adhere to and be familiar with the deadlines set forth by the Graduate College regarding defenses. Students must be registered in at least one credit hour at the time of their defense.

**PhD in Mechanical or Aerospace Engineering with a Concentration in Engineering Education**
Students pursuing the Doctor of Philosophy degree in Mechanical or Aerospace Engineering are eligible to apply for the Engineering Education concentration (http://engineeringed.asu.edu/). The Engineering Education concentration combines research in engineering with research in education. The doctoral Engineering Education concentration will prepare students to become scholars, researchers or practitioners in academia. The concentration provides students with an opportunity to explore pedagogy, methodology, and curriculum and instruction and apply it to engineering.

Students enrolled in the Engineering Education concentration under the PhD degree in Mechanical or Aerospace Engineering will complete

- Eighteen (18) credit hours of graduate MAE coursework (500 level and above),
- Nine (9) credit hours of graduate mathematics-oriented coursework (500 level and above),
- Fifteen (15) credit hours of graduate engineering education coursework, to consist of the following courses:
• ENE 701: Foundations of Engineering Education (3 credit hours)
• ENE 702: Assessment and Evaluation in Engineering Education (3 credit hours)
• ENE 703: Research Methods in Engineering Education (3 credit hours)
• ENE 704: Advanced Research Methods in Engineering Education (3 credit hours)
• ENE 780: Engineering Education Practicum: Applied Project (3 credit hours)

Three (3) of these courses will count towards the nine (9) “minor” credit hours required for the PhD degree in mechanical or aerospace engineering.

The program is directed toward original research. The students will be required to write and defend a dissertation that describes an original technical contribution to the chosen engineering discipline that also integrates an education component (i.e., research on engineering pre-university programs, undergraduate engineering curriculum and instruction, etc.). The research results should be suitable for publication in a peer-reviewed journal. The PhD dissertation committee must include at least two (2) members from education-related disciplines. Designation of one of these two members as the dissertation co-chair is encouraged but not required. Students will be required to satisfy all MAE qualifying and comprehensive requirements and to abide by all policies set forth by SEMTE. Note that the Engineering Education concentration, in effect, requires six (6) credit hours of coursework beyond the minimum required for a PhD in mechanical or aerospace engineering with no concentration. Students wishing to pursue the Engineering Education concentration must apply directly to that concentration and are not able to submit a plan change; if a student is admitted into this concentration and wishes to pursue a general Mechanical or Aerospace engineering degree, he/she will have to reapply to the general PhD program.

Graduate Student Advising
For initial advising, incoming PhD students will report to the Graduate Program Chair who may arrange for a temporary advisor based on the student’s stated area of interest. The initial faculty advisor should be considered temporary until such time as a permanent faculty chair is selected.

Graduate Course Offerings
Listed below are the graduate course offerings in a given research area. A full description of the courses is provided in the ASU catalog. Course selection must be determined in consultation with the PC chair. Please note that these are courses offered within a certain area but it is NOT required to take all of them and not all are offered regularly. They are suggestions for courses if you want to design your coursework around one specific area.

a. Design, Systems and Control:
   MAE 506 Advanced System Modeling, Dynamics and Control
   MAE 507 Optimal Control
   MAE 527 Finite Elements for Engineers
   MAE 540 Advanced Product Design Methodology
   MAE 541 CAD Tools for Engineers
MAE 542 Design Geometry & Kinematics
MAE 544 Mechanical Design and Failure Prevention
MAE 546 Advanced CAE Simulation
MAE 547 Mechanical Design and Control of Robots
MAE 598 Digital Control: Design and Implementation
MAE 598 Multi-Robot Systems

b. Fluid Mechanics Science and Engineering:
MAE 504 Experimental Methods in Thermal and Fluid Processes
MAE 527 Finite Elements for Engineers
MAE 536 Combustion
MAE 561 Computational Fluid Dynamics
MAE 564 Advanced Aerodynamics
MAE 566 Rotary-Wing Aerodynamics
MAE 571 Fluid Mechanics
MAE 572 Advanced High-Speed Flows
MAE 573 Viscous Fluid Flow
MAE 574 Fluid Transport in Micro/Nanoscale Devices
MAE 575 Turbulence
MAE 577 Turbulent Flow Modeling
MAE 578 Geophysical and Environmental Fluid Dynamics
MAE 598 Climate and Environmental Prediction
MAE 598 Advanced Computational Fluid Dynamics
MAE 598 Spectral Methods in Computational Fluid Dynamics
MAE 598 Multiphase Flows
MAE 598 Continuum Mechanics
MAE 598 High Speed Computing

c. Mechanics and Dynamics of Solids:
MAE 510 Dynamics and Vibrations
MAE 512 Random Vibrations
MAE 515 Structural Dynamics
MAE 521 Structural Optimization
MAE 523 Fracture Mechanics
MAE 524 Theory of Elasticity
MAE 525 Mechanics of Smart Materials and Structures
MAE 527 Finite Elements for Engineers
MAE 557 Mechanics of Composite Materials
MAE 598 Continuum Mechanics
MAE 598 Polymers and Composites
MAE 598 High Speed Computing
MAE 598 Vibrations
MAE 598 Advanced Computational Mechanics
MAE 598 Structural Materials in Nuclear Power Systems
MAE 598 Plasticity
MAE 598 Mechanics of Micro/Nano Systems
MAE 598 Probabilistic Methods for Engineering Analysis and Design
MAE 598 Dynamic Behavior of Materials

d. Transport Phenomena, Thermodynamics and Energy:
   MAE 504 Experimental Methods in Thermal and Fluid Processes
   MAE 527 Finite Elements for Engineers
   MAE 536 Combustion
   MAE 561 Computational Fluid Dynamics
   MAE 570 Thermodynamics
   MAE 581 Advanced Thermodynamics
   MAE 585 Solar Thermal Engineering
   MAE 586 Advanced Heat Transfer
   MAE 587 Radiation Heat Transfer
   MAE 589 Heat Transfer
   MAE 598 Wind Energy
   MAE 598 Energy Systems Engineering
   MAE 598 Renewable Energy Engineering
   MAE 598 Renewable Power Plant Design
   MAE 598 Rocket Propulsion
   MAE 598 Internal Combustion Engines
   MAE 598 Nanoscale Heat Transfer
   MAE 598 Aircraft Propulsion

e. Mathematics Electives:
   MAE 501 Linear Algebra in Engineering
   MAE 502 Partial Differential Equations in Engineering
MAE 505 Perturbation Methods
MAE 512 Random Vibrations
MAE 521 Structural Optimization
MAE 542 Design Geometry and Kinematics
MAE 598-Advanced Computational Fluid Dynamics (offered Fall 2013 and prior)
MAE 598-Advanced CFD-Spectral Methods (first offered Fall 2014)/Spectral Methods in Computational Fluid Dynamics
MAE 598-Advanced Computational Mechanics (approved as of Spring 14)

MAT 500 level or above courses
APM 500 level or above courses (not APM 525 High Performance Computing)
STP 500 level or above courses
PHY 501 Methods of Computational and Theoretical Physics
PHY 502 Methods of Theoretical Physics
EEE 550 Transform Theory and Applications
**Mechanical/Aerospace (MAE) MS Non-Thesis Degree Requirements**

*Please review the MAE MS handbook for more specific information about the program breakdown: [http://engineering.asu.edu/semte/GradHandbooks.html](http://engineering.asu.edu/semte/GradHandbooks.html)*

At least fifteen (15) credit hours of graduate MAE coursework (500 level and above):

1. 
2. 
3. 
4. 
5. 

At least six (6) credit hours of graduate mathematics-oriented courses:

1. 
2. 

*Recommendations: MAE 501, MAE 502, MAE 505 (see all options in handbook-Appendix A). MAE math-oriented courses may not also count towards the 15 credit hours of graduate MAE coursework.*

At least nine (9) credit hours of additional graduate courses; these may be either MAE or non-MAE courses, and are not restricted to science, mathematics, or engineering:

- **Applied Project** Students: typically only 3 credits of MAE 593 count toward your iPOS. 3 additional hours can be added with approval from the Graduate Program Chair.

- **Portfolio** Students take 9 credits of additional graduate coursework.

1. 
2. 
3. 

**Total: 30 credits**

**Critical requirements to be aware of:**

- All courses must be at the 500 level.
- A maximum of 3 credit hours of internship (MAE 584) may be used towards the elective credits section in the Plan of Study/degree requirements.
- Must have one chair for applied project; no committee members are necessary.

*Updated 082314*
SEMTE Mechanical/Aerospace (MAE) MS Thesis Degree Requirement

*Please review the MAE MS handbook for more specific information about the program breakdown: http://engineering.asu.edu/semte/GradHandbooks.html

At least twelve (12) credit hours of graduate MAE coursework (500 level and above):

1. 
2. 
3. 
4. 

At least six (6) credit hours of graduate mathematics-oriented courses:

1. 
2. 

*Recommendations: MAE 501, MAE 502, MAE 505 (see all options in handbook-Appendix A). MAE math-oriented courses may not also count towards the 15 credit hours of graduate MAE coursework.

At least six (6) credit hours of additional graduate courses; these may be either MAE or non-MAE courses, and are not restricted to science, mathematics, or engineering:

1. 
2. 

*May use up to 6 credits combined of MAE 591: Seminar or MAE 594: Graduate Research Conference.

Exactly six (6) credits of MAE 599: Thesis

**Total: 30 credits**

Critical requirements to be aware of:

- All courses must be at the 500 level.
- A maximum of 3 credit hours of internship (MAE 584) may be used towards the elective credits section in the Plan of Study/degree requirements.

Updated 082314
Mechanical/Aerospace Engineering (MAE) PhD Degree Requirements

*Please review the MAE handbook for more specific information about the program breakdown: http://engineering.asu.edu/semte/GradHandbooks.html

MAE Research Area: At least 18 credit hours

1. ____________ 3 credit hours
2. ____________ 3 credit hours
3. ____________ 3 credit hours
4. ____________ 3 credit hours
5. ____________ 3 credit hours
6. ____________ 3 credit hours

Math: At least 9 credit hours
- Recommended MAE 501, MAE 502 & MAE 505; if these courses are selected for this area, they may not also be counted towards the number of credit hours for the MAE requirement.

1. ____________ 3 credit hours
2. ____________ 3 credit hours
3. ____________ 3 credit hours

Technical Electives: At least 9 credit hours

1. ____________ 3 credit hours
2. ____________ 3 credit hours
3. ____________ 3 credit hours

MAE 799 Dissertation 12 credit hours exactly

MAE 792 Research Remaining hours to achieve 84 hours total (or MAE 591 Seminar or MAE 584 Internship)

Additional Information and Critical Requirements to be aware of:
- Previously awarded Master’s Degree with coursework in the above areas may be credited toward total for up to 30 hours.
- All credits in MAE must be graduate level (500 or higher), up to two 400 level courses outside of MAE allowed.
- MAE PhD students must maintain a minimum GPA of 3.25. A maximum of 3 credit hours of internship (MAE 584) may be used towards the elective credits section in the Plan of Study/degree requirements.

Total: 84 credits

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