NOT FOR USE FOR CURRICULAR COURSE CHANGES
REQUEST FOR PROGRAM IMPROVEMENTS

NOTE: Changes to programs may require course changes, which must be processed electronically. Any questions should be directed to Associate Provost David Reinhold at 7-4564 or david.reinhold@wmich.edu

DEPARTMENT: MAE
PROPOSED EFFECTIVE FALL YEAR: 2020

PROPOSED IMPROVEMENTS: Academic Program Proposed Improvements

☐ New degree*
☐ New major*
☐ New curriculum*
☐ New concentration*
☐ New certificate*

☐ Admission requirements
☐ Graduation requirements
☐ Revised major
☐ Revised minor
☐ Change in Title
☐ Transfer

☐ Other (explain**)

** Other: Only revised general education requirements for WMU Essential Studies

Title of degree, curriculum, major, minor, concentration, or certificate: Aerospace Engineering Major (ASPJ)

Chair, Department Curriculum Committee: [Signature] Date 10/4/2019

CHECKLIST FOR DEPARTMENT CHAIRS/DIRECTORS

☐ For new programs and other changes that have resource implications, the dean has been consulted.
☐ When appropriate, letters of support from department faculty are attached.
☐ When appropriate, letters of support from other departments in the same college are attached.
☐ When appropriate, letters of support from other college deans, whose programs/courses may be affected by the change, are attached.
☐ The proposal has been reviewed by HIGE for possible implications for international student enrollment.
☐ The proposal is consistent with the departmental assessment plan, and identifies measurable learning outcomes for assessment.
☐ Detailed resource plan is attached where appropriate.
☐ All questions attached have been completed and supporting documents are attached.
☐ The proposal is written and complete as outlined in the Faculty Senate guidelines and the curriculum change guides.

Chair/Director: [Signature] Date 10/4/19

CHECKLIST FOR COLLEGE CURRICULUM COMMITTEE

☐ The academic quality of the proposal and the faculty involved has been reviewed.
☐ Detailed resource plan is attached where appropriate.
☐ Consistency between the proposal and the relevant catalog language has been confirmed.
☐ The proposal has been reviewed for effect on students transferring from Michigan community colleges. Detailed information on transfer articulation must be included with undergraduate proposals.
☐ Consistency between the proposal and the College and department assessment plans has been confirmed.
☐ Consistency between the proposal and the College and department strategic plans has been confirmed.
☐ All questions attached have been completed and supporting documents are attached.
☐ The proposal is written and complete as outlined in the Faculty Senate guidelines and the curriculum change guides.

Chair, College Curriculum Committee: Date

Revised Sept. 2018. All previous forms are obsolete and should not be used.
# CHECKLIST FOR COLLEGE DEANS

- For new programs and proposed program deletions, the provost has been consulted.
- For new programs, letter of support from University Libraries Dean indicating library resource requirements have been met.
- When appropriate, letters of support from other college faculty and/or chairs are attached.
- When appropriate, letters of support from other college deans, whose programs/courses may be affected by the change, are attached.
- The proposal has been reviewed for implications for accreditation, certification, or licensure.
- Detailed resource plan is attached where appropriate.
- All questions attached have been completed and supporting documents are attached.
- The proposal is written and complete as outlined in the Faculty Senate guidelines and the curriculum change guides.

<table>
<thead>
<tr>
<th>Dean:</th>
<th>Date</th>
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# FOR PROPOSALS REQUIRING REVIEW BY:
GSC/USC, EPGC, GRADUATE COLLEGE, and/or FACULTY SENATE EXECUTIVE BOARD

- Return to Dean
- Forward to:
  - Curriculum Manager: Date:
    - *needs review by Date
- Approve ☐ Disapprove ☐ Chair, GSC/USC: Date
- Approve ☐ Disapprove ☐ Chair, EPGC: Date
- Approve ☐ Disapprove ☐ Graduate College Dean: Date
- Approve ☐ Disapprove ☐ Faculty Senate President: Date

- *needs review by Date
- Approve ☐ Disapprove ☐ Provost: Date

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NOT FOR USE FOR CURRICULAR COURSE CHANGES
REQUEST FOR PROGRAM IMPROVEMENTS

1. Explain briefly and clearly the proposed improvement:
   
   Updated program content to address WMU Essential Studies Program requirements.

2. Rationale. Give your reason(s) for the proposed improvement.
   
   Required to remove references to general education requirements and update with WMU Essential Studies Program requirements.

3. Effect on other colleges, departments, or programs. If consultation with others is required, attach evidence of consultation and support. If objections have been raised, document the resolution. Demonstrate that the program you propose is not a duplication of an existing one.
   
   No effect.

4. Effect on your department’s programs. Show how the proposed change fits with other departmental offerings.
   
   None.

5. Alignment with college’s and department’s strategic plan, mission, and vision.
   
   Provides broad-based liberal arts education for aerospace engineering students and supports both ABET requirements and AIAA Body of Knowledge recommendations to ensure we graduate well-rounded aerospace engineers ready to lead challenges facing our society.

6. Effect on enrolled students: Are program conflicts avoided? Will your proposal make it easier or harder for students to meet graduation requirements? Can students complete the program in a reasonable time? Show that you have considered scheduling needs and demands on students’ time.
   
   No effect on enrolled students as they will continue under the catalog year with which they entered. A deliberate transition will occur university-wide to address any issues that arise for current students.

7. Student or external market demand. What is your anticipated student audience? What evidence of student or market demand or need exists? What is the estimated enrollment? What other factors make your proposal beneficial to students?
   
   Not applicable.

8. Effects on resources. Explain how your proposal would affect department and University resources, including faculty, equipment, space, technology, and library holdings. If proposing a new program, include a letter and/or email of support from the university libraries affirming that the library resource issues have been reviewed. Tell how you will staff additions to the program. If more advising will be needed, how will you provide for it? What will be the initial one-time costs and the ongoing base-funding costs for the proposed program? (Attach additional pages, as necessary.)
   
   None. All revisions to the aerospace engineering program in response to the new WMU Essential Studies Program were coordinated across the college and university through the WMU Essential Studies Program design.

9. List the learning outcomes for the revised or proposed major, minor, or concentration. The department will use these outcomes for future assessments of the program.
   
   No change to program outcomes.

   1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
   2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
   3. an ability to communicate effectively with a range of audiences.
   4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
   5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

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6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
10. Describe how this change is a response to assessment outcomes that are part of a department or college assessment plan or informal assessment activities.

The changes were in response to a university-wide revised general education program.

11. (Undergraduate proposals only) Describe in detail how this change affects transfer articulation for Michigan community colleges. For new majors or minors, describe transfer guidelines to be developed with Michigan community colleges. For revisions to majors or minors, describe necessary revisions to Michigan community college guidelines. Department chairs should seek assistance from college advising directors or from the admissions office in completing this section.

This aspect is being addressed by the Director of the WMU Essential Studies Program, the Associate Provost for Assessment and Undergraduate Studies, and the advising staff.

12. Please offer both “Current Catalog Language” and “Proposed Catalog Language” if there is to be a change in the catalog description for a given program. For the “current” language, please copy and paste relevant language from the most current catalog and for the “proposed” language, please share the exact proposed new catalog language. As possible, bold or otherwise note the key changes in the new proposed catalog language.

See Attachments

Revised Sept. 2018. All previous forms are obsolete and should not be used.
CURRENT CATALOG COPY


The following Program Educational Objectives (PEO) are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve within two to five years after graduation.

Career Growth: as demonstrated by metrics such as achieving proficiency in current position, increasing responsibility, diversity of job functions, recognition, progression and/or job advancement.

Professional Development: as demonstrated by metrics such as pursuing additional educational activities, professional certifications, leadership effectiveness, staying current with evolving technologies and/or demonstrating initiative.

Service: as demonstrated by metrics such as involvement in their communities, professional societies, and/or humanitarian endeavors.

Innovation: as demonstrated by metrics such as the development of new processes, devices, methods, patents, and/or dissemination of knowledge.

(For up-to-date educational objectives and learning outcomes, see the department’s Web site at www.wmich.edu/mechanical-aerospace/academics/aerospace)

Admission
To be admitted to this engineering curriculum, a student must complete all pre-engineering requirements with grades of “C” or better.

These requirements may be found in the beginning of the College of Engineering and Applied Sciences section.

Students seeking admission to this curriculum must submit an application following procedures established by the College of Engineering and Applied Sciences. Upper level transfer students may complete an application prior to their first semester of enrollment.

Only students in good academic standing as defined by the University will be admitted to this curriculum.

Baccalaureate-Level Writing Requirement

Students who have chosen the Aerospace Engineering curriculum will satisfy the Baccalaureate-Level Writing Requirement by successfully completing: ME 4800 - Mechanical Engineering Project.

Requirements

Candidates for the Bachelor of Science in Engineering (Aerospace) must satisfy the following requirements in addition to those required by Western Michigan University:

- A grade point average of 2.0 or better must be earned in courses presented for graduation with AE, ECE, IEE, EDMM, and ME prefixes.

- A student is required to earn a grade of “C” or better in all 1000-3000 level departmental prerequisite courses before enrollment is permitted in the next sequence course.

- No more than two grades of “D” or “DC” in courses presented for graduation may be counted for graduation.

- Complete the following program of 129-130 semester credit hours. The schedule below is an example of one leading to graduation in eight semesters, beginning in the fall.

Revised Sept. 2018. All previous forms are obsolete and should not be used.
The Aerospace Engineering curriculum requires students to complete a course in General Education Area I, Area II, Area III, Area IV, Area V, and Area VIII. At least two of the General Education Area courses must be at the 3000/4000-level, and no more than two courses from any one department may be used to satisfy the Area requirements.

**First Semester (16 hours)**

General Education Area VIII: Health and Well-Being  **Credits:** 2 hours  
CHEM 1100 - General Chemistry  **Credits:** 3 hours  
(Pre-engineering requirement)  
CHEM 1110 - General Chemistry Laboratory  **Credits:** 1 hour  
(Pre-engineering requirement)  
IEE 1020 - Technical Communication  **Credits:** 3 hours  
(Pre-engineering requirement)  
EDMM 1420 - Engineering Graphics  **Credits:** 3 hours  
MATH 1220 - Calculus I  **Credits:** 4 hours  
or  
MATH 1700 - Calculus I, Science and Engineering  **Credits:** 4 hours  
(Pre-engineering requirement)

**Second Semester (18 hours)**

General Education Area II: Humanities  **Credits:** 3 hours  
AE 2610 - Introduction to Aerospace Engineering  **Credits:** 3 hours  
CS 1200 - Programming in C for Engineers  **Credits:** 3 hours  
(Pre-engineering requirement)  
MATH 1230 - Calculus II  **Credits:** 4 hours  
or  
MATH 1710 - Calculus II, Science and Engineering  **Credits:** 4 hours  
(Pre-engineering requirement)  
PHYS 2050 - University Physics I  **Credits:** 4 hours  
(Pre-engineering requirement)  
PHYS 2060 - University Physics I Laboratory  **Credits:** 1 hour  
(Pre-engineering requirement)

**Third Semester (18 hours)**

General Education Area V: Social and Behavioral Science  **Credits:** 3 hours  
MATH 2720 - Multivariate Calculus and Matrix Algebra  **Credits:** 4 hours  
(Pre-engineering requirement)

Revised Sept. 2018. All previous forms are obsolete and should not be used.
ME 2320 - Thermodynamics | Credits: 3 hours
(Pre-engineering requirement)
ME 2560 - Statics | Credits: 3 hours
(Pre-engineering requirement)
PHYS 2070 - University Physics I | Credits: 4 hours
(Pre-engineering requirement)
PHYS 2080 - University Physics II Laboratory | Credits: 1 hour
(Pre-engineering requirement)

Fourth Semester (17-18 hours)

ECE 2100 - Circuit Analysis | Credits: 4 hours
(Pre-engineering requirement)
MATH 3740 - Differential Equations and Linear Algebra | Credits: 4 hours
ME 2570 - Mechanics of Materials | Credits: 3 hours
ME 2580 - Dynamics | Credits: 3 hours
PHYS 3090 - Introductory Modern Physics | Credits: 4 hours
or
CHEM 1120 - General Chemistry II | Credits: 3 hours

Fifth Semester (16 hours)

General Education Area III: U.S. Cultures and Issues | Credits: 3 hours
General Education Area IV: Other Cultures and Civilizations | Credits: 3 hours
AE 3610 - Aerodynamics I | Credits: 4 hours
ME 3600 - Control Systems | Credits: 3 hours
ME 3620 - Theory of Engineering Experimentation | Credits: 3 hours

Sixth Semester (16 hours)

General Education Area I: Fine Arts | Credits: 4 hours
AE 3710 - Aerodynamics II | Credits: 3 hours
AE 3800 - Flight Vehicle Performance | Credits: 3 hours
ME 3350 - Instrumentation | Credits: 3 hours
AE 4700 - Orbital Mechanics | Credits: 3 hours

Seventh Semester (13 hours)

Aerospace Elective | Credits: 3 hours
AE 4600 - Aircraft Stability and Control | Credits: 3 hours

Revised Sept. 2018. All previous forms are obsolete and should not be used.
AE 4630 - Aerospace Structural Design Credits: 3 hours
AE 4660 - Aerospace Propulsion I Credits: 3 hours
ME 4790 - Mechanical Engineering Project Planning Credits: 1 hour

Eighth Semester (15 hours)

Aerospace Elective Credits: 3 hours
Aerospace Elective Credits: 3 hours
AE 4690 - Aircraft Design Credits: 3 hours
AE 4760 - Aerospace Propulsion II Credits: 3 hours
ME 4800 - Mechanical Engineering Project Credits: 3 hours

Aerospace Engineering Electives

Students must complete a total of three elective courses from the list below.

Thermal/Fluid Science

AE 5200 - Advanced Aerodynamics Credits: 3 hours
ME 4310 - Heat Transfer Credits: 3 hours
ME 4320 - Thermodynamics II Credits: 3 hours
ME 5300 - Theoretical and Computational Fluid Mechanics Credits: 3 hours
ME 5450 - Computational Fluid Dynamics I Credits: 3 hours

Structures/Material Science

- AE 5100 - Foundations of Structural Mechanics Credits: 3 hours
- ME 4570 - Experimental Solid Mechanics Credits: 3 hours
- ME 5610 - Finite Element Method Credits: 3 hours
- ME 5690 - Principles of Fatigue and Fracture Credits: 3 hours

Flight Dynamics and Control

- AE 4590 - Flight Test Engineering and Design Credits: 3 hours
- AE 5400 - Aerospace Vehicle Dynamics Credits: 3 hours
- ME 4710 - Motion and Control Credits: 3 hours
- ME 5410 - Continuous System Modeling & Simulation Credits: 3 hours
- ME 5430 - Mechanical Systems Control Credits: 3 hours

System/Component Design

Revised Sept. 2018. All previous forms are obsolete and should not be used.
PROPOSED CATALOG COPY (CHANGES IN YELLOW)


The following Program Educational Objectives (PEO) are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve within two to five years after graduation.
Career Growth: as demonstrated by metrics such as achieving proficiency in current position, increasing responsibility, diversity of job functions, recognition, progression and/or job advancement.
Professional Development: as demonstrated by metrics such as pursuing additional educational activities, professional certifications, leadership effectiveness, staying current with evolving technologies and/or demonstrating initiative.
Service: as demonstrated by metrics such as involvement in their communities, professional societies, and/or humanitarian endeavors.
Innovation: as demonstrated by metrics such as the development of new processes, devices, methods, patents, and/or dissemination of knowledge.
(For up-to-date educational objectives and learning outcomes, see the department’s Web site at www.wmich.edu/mechanical-aerospace/academics/aerospace)

Admission
To be admitted to this engineering curriculum, a student must complete all pre-engineering requirements with grades of “C” or better. These requirements may be found in the beginning of the College of Engineering and Applied Sciences section.
Students seeking admission to this curriculum must submit an application following procedures established by the College of Engineering and Applied Sciences. Upper level transfer students may complete an application prior to their first semester of enrollment. Only students in good academic standing as defined by the University will be admitted to this curriculum.

WMU Essential Studies Program Requirements
Students who have chosen the Aerospace Engineering curriculum will satisfy the WMU Essential Studies Program Requirements as outlined within the course listings below. To satisfy these requirements students take courses in twelve (12) categories. Six (6) of the courses are designated within the aerospace engineering program requirements and six (6) are free electives which students choose from a list of courses in the corresponding course category. Students will meet the planetary sustainability outcome in AE4800: Senior Design Project and must select a course that satisfies the Diversity and Inclusion outcome when choosing a course in the other six (6) categories.

Requirements
Candidates for the Bachelor of Science in Engineering (Aerospace) must satisfy the following requirements in addition to those required by Western Michigan University:

A grade point average of 2.0 or better must be earned in courses presented for graduation with AE, ECE, IEE, EDMM, and ME prefixes. A student is required to earn a grade of “C” or better in all 1000-3000 level departmental prerequisite courses before enrollment is permitted in the next sequence course.

Revised Sept. 2018. All previous forms are obsolete and should not be used.
No more than two grades of “D” or “DC” in courses presented for graduation may be counted for graduation.

Complete the following program of 129-130 semester credit hours. The schedule below is an example of one leading to graduation in eight semesters, beginning in the fall.

The Aerospace Engineering curriculum requires students to complete a course in General Education Area I, Area II, Area III, Area IV, Area V, and Area VIII. At least two of the General Education Area courses must be at the 3000/4000 level, and no more than two courses from any one department may be used to satisfy the Area requirements.

**First Semester (17 hours)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>WMU Essential Studies Level 1: Inquiry and Engagement Course Elective</td>
<td>Credits: 3 hours</td>
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<tr>
<td>CHEM 1100 - General Chemistry</td>
<td>Credits: 3 hours</td>
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<tr>
<td>(Pre-engineering requirement)</td>
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<tr>
<td>CHEM 1110 - General Chemistry Laboratory</td>
<td>Credits: 1 hour</td>
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<tr>
<td>(Pre-engineering requirement)</td>
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<tr>
<td>IEE 1020 - Technical Communication</td>
<td>Credits: 3 hours</td>
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<tr>
<td>(Pre-engineering requirement; Satisfies WMU Essential Studies Level 1: Writing Course Requirement)</td>
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<tr>
<td>EDMM 1420 - Engineering Graphics</td>
<td>Credits: 3 hours</td>
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<tr>
<td>MATH 1220 - Calculus I</td>
<td>Credits: 4 hours</td>
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<td>or</td>
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<tr>
<td>MATH 1700 - Calculus I, Science and Engineering</td>
<td>Credits: 4 hours</td>
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<tr>
<td>(Pre-engineering requirement; Satisfies WMU Essential Studies Level 1: Quantitative Literacy Course Requirement)</td>
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**Second Semester (18 hours)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>WMU Essential Studies Level 2: Artistic Theory and Practice Course Requirement</td>
<td>Credits: 3 hours</td>
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</tr>
<tr>
<td>AE 2610 - Introduction to Aerospace Engineering</td>
<td>Credits: 3 hours</td>
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<tr>
<td>(Satisfies WMU Essential Studies Level 1: Oral and Digital Communications Course Requirement)</td>
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<tr>
<td>CS 1200 - Programming in C for Engineers</td>
<td>Credits: 3 hours</td>
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<tr>
<td>(Pre-engineering requirement)</td>
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<tr>
<td>MATH 1230 - Calculus II</td>
<td>Credits: 4 hours</td>
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<td>or</td>
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<tr>
<td>MATH 1710 - Calculus II, Science and Engineering</td>
<td>Credits: 4 hours</td>
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<tr>
<td>(Pre-engineering requirement)</td>
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<tr>
<td>PHYS 2050 - University Physics I</td>
<td>Credits: 4 hours</td>
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<tr>
<td>(Pre-engineering requirement; Satisfies WMU Essential Studies Level 2: Laboratory Science Course Requirement)</td>
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<tr>
<td>PHYS 2060 - University Physics I Laboratory</td>
<td>Credits: 1 hour</td>
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<tr>
<td>(Pre-engineering requirement; Satisfies WMU Essential Studies Level 2: Laboratory Science Course Requirement)</td>
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</table>

**Third Semester (18 hours)**

Revised Sept. 2018. All previous forms are obsolete and should not be used.
WMU Essential Studies Level 2: World Language and Culture Course Requirement  Credits: 3 hours
MATH 2720 - Multivariate Calculus and Matrix Algebra Credits: 4 hours
(Pre-engineering requirement)
ME 2320 - Thermodynamics I Credits: 3 hours
(Pre-engineering requirement; Satisfies WMU Essential Studies Level 2: Science and Technology Course Requirement)
ME 2560 - Statics Credits: 3 hours
(Pre-engineering requirement)
PHYS 2070 - University Physics II Credits: 4 hours
(Pre-engineering requirement)
PHYS 2080 - University Physics II Laboratory Credits: 1 hour
(Pre-engineering requirement)

Fourth Semester (17-18 hours)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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</thead>
<tbody>
<tr>
<td>ECE 2100</td>
<td>Circuit Analysis</td>
<td>4 hours</td>
</tr>
<tr>
<td>MATH 3740</td>
<td>Differential Equations and Linear Algebra</td>
<td>4 hours</td>
</tr>
<tr>
<td>ME 2570</td>
<td>Mechanics of Materials</td>
<td>3 hours</td>
</tr>
<tr>
<td>ME 2580</td>
<td>Dynamics</td>
<td>3 hours</td>
</tr>
<tr>
<td>PHYS 3090</td>
<td>Introductory Modern Physics</td>
<td>4 hours</td>
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<td>or</td>
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<tr>
<td>CHEM 1120</td>
<td>General Chemistry II</td>
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Fifth Semester (16 hours)

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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>WMU Essential Studies Level 2: Personal Wellness Course Requirement</td>
<td>3 hours</td>
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<tr>
<td>WMU Essential Studies Level 2: Society and Cultures Course Requirement</td>
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</tr>
<tr>
<td>AE 3610</td>
<td>Aerodynamics I</td>
<td>4 hours</td>
</tr>
<tr>
<td>ME 3600</td>
<td>Control Systems</td>
<td>3 hours</td>
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<tr>
<td>ME 3620</td>
<td>Theory of Engineering Experimentation</td>
<td>3 hours</td>
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Sixth Semester (16 hours)

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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>WMU Essential Studies Level 3: Global Perspectives Course Requirement</td>
<td>3 hours</td>
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</tr>
<tr>
<td>AE 3710</td>
<td>Aerodynamics II</td>
<td>3 hours</td>
</tr>
<tr>
<td>AE 3800</td>
<td>Flight Vehicle Performance</td>
<td>3 hours</td>
</tr>
<tr>
<td>ME 3350</td>
<td>Instrumentation</td>
<td>3 hours</td>
</tr>
<tr>
<td>AE 4700</td>
<td>Orbital Mechanics</td>
<td>3 hours</td>
</tr>
</tbody>
</table>

Revised Sept. 2018. All previous forms are obsolete and should not be used.
Seventh Semester (13 hours)

Aerospace Elective  Credits: 3 hours
AE 4600 - Aircraft Stability and Control  Credits: 3 hours
AE 4630 - Aerospace Structural Design  Credits: 3 hours
AE 4660 - Aerospace Propulsion I  Credits: 3 hours
ME 4790 - Mechanical Engineering Project Planning  Credits: 1 hour

Eighth Semester (15 hours)

Aerospace Elective  Credits: 3 hours
Aerospace Elective  Credits: 3 hours
AE 4690 - Aircraft Design  Credits: 3 hours
AE 4760 - Aerospace Propulsion II  Credits: 3 hours
ME 4800 - Mechanical Engineering Project  Credits: 3 hours
(Satisfies WMU Essential Studies Level 3: Local and National Perspectives Course Requirement)

Aerospace Engineering Electives

Students must complete a total of three elective courses from the list below.

Thermal/Fluid Science

AE 5200 - Advanced Aerodynamics  Credits: 3 hours
ME 4310 - Heat Transfer  Credits: 3 hours
ME 4320 - Thermodynamics II  Credits: 3 hours
ME 5300 - Theoretical and Computational Fluid Mechanics  Credits: 3 hours
ME 5450 - Computational Fluid Dynamics I  Credits: 3 hours

Structures/Material Science

AE 5100 - Foundations of Structural Mechanics  Credits: 3 hours
ME 4570 - Experimental Solid Mechanics  Credits: 3 hours
ME 5610 - Finite Element Method  Credits: 3 hours
ME 5690 - Principles of Fatigue and Fracture  Credits: 3 hours

Flight Dynamics and Control

AE 4590 - Flight Test Engineering and Design  Credits: 3 hours
AE 5400 - Aerospace Vehicle Dynamics  Credits: 3 hours

Revised Sept. 2018. All previous forms are obsolete and should not be used.
ME 4710 - Motion and Control Credits: 3 hours
ME 5410 - Continuous System Modeling & Simulation Credits: 3 hours
ME 5430 - Mechanical Systems Control Credits: 3 hours

System/Component Design

ME 3650 - Machine Design | Credits: 3 hours

Revised Sept. 2018. All previous forms are obsolete and should not be used.
# AEROSPACE ENGINEERING

<table>
<thead>
<tr>
<th>SEM 1</th>
<th>SEM 2</th>
<th>SEM 3</th>
<th>SEM 4</th>
<th>SEM 5</th>
<th>SEM 6</th>
<th>SEM 7</th>
<th>SEM 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 MATH 1220 or 1700 Calculus I</td>
<td>4 MATH 1230 or 1710 Calculus II</td>
<td>4 MATH 2720 Differential Equations</td>
<td>4 MATH 3740</td>
<td>3 AE 3610 AE 3710</td>
<td>3 AE 4600</td>
<td>3 AE 4690</td>
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<td>4 MATH 1150 C or placement</td>
<td>4 MATH 1320 or 1710 C</td>
<td>4 MATH 2720 C</td>
<td>4 MATH 2720 C</td>
<td>3 AE 3610</td>
<td>3 AE 3710</td>
<td>3 AE 4600</td>
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<td>3 CHEM 1100+1110 Chemistry I &amp; Lab</td>
<td>3 PHYS 2950+2960 University Physics I &amp; Lab</td>
<td>3 PHYS 2670+2680 University Physics II &amp; Lab</td>
<td>3 ME 2570 Mechanics of Materials</td>
<td>3 ME 3600 Control Systems</td>
<td>3 AE 3800 Flight Vehicle Performance</td>
<td>3 AE 4630 Aircraft Structural Design</td>
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<td>4+1 MATH 1120 or 1700</td>
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<td>4+1 MATH 2720 or 1710</td>
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<td>3 ME 3600</td>
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<td>3 AE 4760 Aerospace Propulsion II</td>
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<td>3 EDM 1420 Engineering Graphics (Lab)</td>
<td>3 AE 2610 Intro to Aerospace Engineering (Lab)</td>
<td>3 ME 2320 Thermodynamics I</td>
<td>3 ECE 2100 Circuit Analysis I (Lab)</td>
<td>3 ME 3620 Theory of Engineering Experimentation</td>
<td>3 AE 3650</td>
<td>3 AE 4600 Aerospace Propulsion I</td>
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<td>3 IEE 1020 Technical Communication</td>
<td>3 CS 1290 Programming in C for Engineers (Lab)</td>
<td>3 ME 2560 Statics</td>
<td>3 ME 2580 Dynamics</td>
<td>3 ME 3500</td>
<td>3 AE 4800 Aerospace Elective</td>
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<tr>
<td>3 WES Free Elective (See page 3)</td>
<td>3 WES Free Elective (See page 3)</td>
<td>3 CHEM 1120 Chemistry II</td>
<td>3 WES Free Elective (See page 3)</td>
<td>3 WES Free Elective (See page 3)</td>
<td>3 AE 4780 Aerospace Elective</td>
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<tr>
<td>3 WES 1480 Critical Thinking in Arts</td>
<td>3 WES (SCI) Artistic Theory: Practice</td>
<td>3 WES (SCI) World Language/Culture</td>
<td>3 WES (SCI) Social/Cultural Perspective</td>
<td>3 WES (SCI) Scientific Perspective</td>
<td>3 Aerospace Elective</td>
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</table>

**NOTES:** Prerequisite courses are shown in smaller print. A "C" or better is required for admission to upper level CEAS courses.

- AE 5970 C: AE Required (including 9 AE Electives)
- 16 CR: WES Free Elective Required
AE MAPPING INTO WMU Essential Student Learning Outcomes

Connections

Exploration and Discovery

Foundations

= Sequenced courses