CEAS-14-MAE-099

REQUEST TO COLLEGE CURRICULUM COMMITTEE FOR CURRICULAR IMPROVEMENTS

DEPARTMENT: MAE **PROPOSED EFFECTIVE SEMESTER:** Fall 2015 **COLLEGE:** CEAS

PROPOSED IMPROVEMENTS

Academic Program
- ☐ New degree*
- ☐ New major*
- ☐ New curriculum*
- ☐ New concentration*
- ☐ New certificate
- ☐ New minor
- ☐ Revised major
- ☐ Revised minor
- ☐ Admission requirements
- X Graduation requirements
- ☐ Deletion ☐ Transfer
- X Other (explain**)

Substantive Course Changes
- ☐ New course
- ☐ Pre or Co-requisites
- ☐ Deletion (required by others)
- ☐ Course #, different level
- ☐ Credit hours
- ☐ Enrollment restriction
- ☐ Course-level restriction
- ☐ Prefix ☐ Title and description (attach current & proposed)
- ☐ General education (select one)
  Not Applicable
- ☐ Other (explain**)

Misc. Course Changes
- ☐ Title
- ☐ Description (attach current & proposed)
- ☐ Deletion (not required by others)
- ☐ Course #, same level
- ☐ Variable credit
- ☐ Credit/no credit
- ☐ Cross-listing
- ☐ COGE reapproval
- ☐ Other (explain**)

** **Other:** Restructure the Mechanical Engineering elective course list

Title of degree, curriculum, major, minor, concentration, or certificate: N/A

Existing course prefix and #: N/A **Proposed course prefix and #:** N/A **Credit hours:** N/A

Existing course title: N/A

Proposed course title: N/A

Existing course prerequisite & co-requisite(s): N/A
Proposed course prerequisite(s) N/A
If there are multiple prerequisites, connect with "and" or "or". To remove prerequisites, enter "none."
Proposed course co-requisite(s) N/A
If there are multiple corequisites, they are always joined by "and."
Proposed course prerequisite(s) that can also be taken concurrently: N/A
Is there a minimum grade for the prerequisites or corequisites? N/A
The default grades are D for undergraduates and C for graduates.
Major/minor or classification restrictions: N/A
List the Banner 4 character codes and whether they should be included or excluded
For 5000 level prerequisites & corequisites. Do these apply to: (circle one) undergraduates graduates both

Specifications for University Schedule of Classes: N/A
a. Course title (maximum of 30 spaces):
b. Multi-topic course: ☐No ☐Yes
c. Repeatable for credit: ☐ No ☐ Yes
d. Mandatory credit/no credit: ☐ No ☐Yes
e. Type of class and contact hours per week (check type and indicate hours as appropriate)
1. ☐ Lecture
2. ☐ Lab or discussion
3. ☐ Lecture/lab/discussion
4. ☐ Seminar or ☐ studio
5. ☐ Independent study
6. ☐ Supervision or practicum

CIP Code (Registrar's use only)

Chair/Director _____ Date 3/4/2015

Chair, College Curriculum Committee _____ Date

Dean _____ Date: Graduate Dean _____ Date

Curriculum Manager: Return to dean ☐ Date _____ Forward to: _____ Date

Chair, COGE/ PEB / FS President _____ Date

FOR PROPOSALS REQUIRING GSC/USC REVIEW:

* ☐ Approve ☐ Disapprove	Chair, GSC/USC	Date
* ☐ Approve ☐ Disapprove	Provost	Date

Revised May 2007. All previous forms are obsolete and should not be used

1. Explain briefly and clearly the proposed improvement.

   The proposed changes are to: (1) Eliminate the current ME Group 1 Elective (Advanced Thermodynamics Electives) from the ME elective course list, making ME 4320 a required course (2) Make all 5000-level courses undergraduate electives and 3) Restructure the ME Elective Course List so that it includes only two groups (instead of the current three). The groups will be: Group 1 – Electives from Undergraduate Courses and Group 2- Electives from Graduate Courses (5000 level). Design and Laboratory courses are designated with "D" and "L", respectively. Students may select *any five different courses* from Group 1 and/or Group 2, out of which two must be "design" and two must be "laboratory" courses.

2. Rationale. Give your reason(s) for the proposed improvement. (If your proposal includes prerequisites, justify those, too.)

   Rationale for change #1: The current ME Group 1 elective includes only two courses (ME 4320 Thermodynamics II and AE 4660, Aeronautical Propulsion Systems). The vast majority of ME students take ME 4320 because it is the only ME course offered in Group 1. Based on this and also on the value ME 4320 will add to the core mechanical engineering curriculum, ME 4320 will be made a required core course. ME 4320 will be offered in semester 5 (in the current ME Group 1 Elective slot).

   Rationale for change #2: The current ME elective list includes only a subset of 5000-level courses. The proposed change makes all ME 5000-level courses available to undergraduate students to provide upper-classmen with more coursework options and flexibility. These courses are listed in their own group (Graduate Electives). Students can select any courses in this group to meet design and laboratory requirements.

   Rationale for change #3: Currently, courses that meet design requirements are double-listed in Design and Elective Emphasis group. Grouping courses in Undergraduate and Graduate lists eliminates having to list courses in multiple groups, making the selection easier for advisers and students. In the proposed grouping, courses that meet design and/or laboratory requirements (at any level, graduate or undergraduate) are clearly designated with a "D" and/or and "L." Students can select any five different courses as long as they meet the (2) laboratory and (2) design curriculum requirements. Any two design courses can be selected, which is consistent with new ABET requirements stating that students should demonstrate professional competence in only one area (i.e., thermal systems or mechanical systems).

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.

   The removal of the ME Group 1 elective will also remove AE 4660 (Aeronautical Propulsion Systems). However AE 4660 remains in the elective list so ME students will be able to take this course. The change of ME 4320 from an elective to a required course will strengthen the ME core curriculum and fits well with current offerings.

5. Effects 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. If a required course will be offered during summer only, provide a rationale.

   The proposed changes will make it easier for students to meet graduation requirements because more elective course options are made available and they have additional flexibility when choosing design electives. The change has no effect on the number of credit hours required for students to graduate so students can complete the program in a reasonable time.

6. 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?

ME students have complained about the fact that the Current ME Group 1 elective is not a true elective group because there is only one ME course available in that group. This proposal addresses this issue and also provides students with a broader selection of elective courses.

7. Effects on resources. Explain how your proposal would affect department and University resources, including faculty, equipment, space, technology, and library holdings. Tell how you will staff additions to the program. If more advising will be needed, how will you provide for it? How often will course(s) be offered? What will be the initial one-time costs and the ongoing base-funding costs for the proposed program? (Attach additional pages, as necessary.)

   No effect. ME 4320 is already offered every semester to meet student demands for this course.

8. General education criteria. For a general education course, indicate how this course will meet the criteria for the area or proficiency. (See the General Education Policy for descriptions of each area and proficiency and the criteria. Attach additional pages as necessary. Attach a syllabus if (a) proposing a new course, (b) requesting certification for baccalaureate-level writing, or (c) requesting reapproval of an existing course.)

   This proposal does not target or affect any general education courses.

9. List the learning outcomes for the proposed course or the revised or proposed major, minor, or concentration. These are the outcomes that the department will use for future assessments of the course or program.

   This proposal does not relate to course outcomes.

10. Describe how this curriculum change is a response to assessment outcomes that are part of a departmental or college assessment plan or informal assessment activities.

    This proposal streamlines the ME-elective course list and addresses new ABET assessment criteria, requiring students to demonstrate professional competency in one (Thermal or Mechanical systems) area.

11. (Undergraduate proposals only) Describe, in detail, how this curriculum change affects transfer articulation for Michigan community colleges. For course changes, include detail on necessary changes to transfer articulation from Michigan community college courses. 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.

    The proposed changes target elective courses; therefore there are no anticipated impacts on transfer students.

Mechanical Engineering Electives (CURRENT)

Students must complete a total of six elective courses from the list below (Groups 1, 2, and 3). One course is selected from Group 1, two courses from Group 2, and three courses from Group 3. Two of the selected courses must have laboratory experience (marked with an "L" in list).

Group 1: Advanced Thermodynamics electives (select one)

- AE 4660 - Aeronautical Propulsion Systems **Credits:** 4 hours (L)
- ME 4320 - Thermodynamics II **Credits:** 3 hours

Group 2: Design electives (select two)

Thermal Systems Design electives (select one)

- ME 4330 - Environmental Systems Design in Buildings **Credits:** 3 hours
- This course has a prerequisite that is an elective.
- ME 4390 - Design of Thermal Systems **Credits:** 3 hours (L)
- This course has a prerequisite that is an elective.
- ME 4680 - Engine Design **Credits:** 3 hours (L)
- This course has a prerequisite that is an elective.
- ME 5390 - Advanced Thermal Design **Credits:** 3 hours

Mechanical Systems Design electives (select one)

- AE 4630 - Aerospace Structural Design **Credits:** 4 hours
- ME 4530 - Machine Design II **Credits:** 3 hours
- ME 4700 - Vehicle Structural Design **Credits:** 3 hours
- ME 5730 - Materials Selection in Design **Credits:** 3 hours

Group 3: Elective Emphasis

Select three: must be different from any selected from Groups 1 and 2

Cooperative Education

Repeatable 3 times to count as one elective 3 credit course.

- ME 3990 - Cooperative Education **Credits:** 1 hour

Thermal/Fluid Systems

- AE 3610 - Aerodynamics I **Credits:** 4 hours (L)
- AE 4660 - Aeronautical Propulsion Systems **Credits:** 4 hours (L)
- ME 3670 - Internal Combustion Engines I **Credits:** 3 hours (L)
- ME 4320 - Thermodynamics II **Credits:** 3 hours
- ME 4330 - Environmental Systems Design in Buildings **Credits:** 3 hours
  This course has a prerequisite that is an elective.
- ME 4390 - Design of Thermal Systems **Credits:** 3 hours (L)
- This course has a prerequisite that is an elective.
- ME 4680 - Engine Design **Credits:** 3 hours (L)
- ME 5390 - Advanced Thermal Design **Credits:** 3 hours
- ME 5710 - Gas Dynamics **Credits:** 3 hours

Solid Mechanics and Structures

- AE 4630 - Aerospace Structural Design **Credits:** 4 hours
- AE 4690 - Aircraft Design **Credits:** 3 hours
- ME 4530 - Machine Design II **Credits:** 3 hours (L)
- ME 4570 - Experimental Solid Mechanics **Credits:** 3 hours (L)
- ME 4700 - Vehicle Structural Design **Credits:** 3 hours
- ME 5530 - Advanced Product Engineering **Credits:** 3 hours
  This course has a prerequisite that is an elective.
- ME 5690 - Principles of Fatigue and Fracture **Credits:** 3 hours
- ME 5730 - Materials Selection in Design **Credits:** 3 hours
- ME 5750 - Tribology - Principles and Applications **Credits:** 3 hours

Dynamics and Control

- AE 4600 - Aircraft Stability and Control **Credits:** 3 hours
- ME 4590 - Dynamics of Machinery **Credits:** 3 hours
- ME 4650 - Vehicle Dynamics **Credits:** 3 hours
- ME 4710 - Motion and Control **Credits:** 3 hours (L)

- ME 4810 - Vehicle Design **Credits:** 3 hours (L)
- ME 5400 - Automatic Control of Flight Vehicles **Credits:** 3 hours
- ME 5410 - Continuous System Modeling & Simulation **Credits:** 3 hours
- ME 5430 - Mechanical Systems Control **Credits:** 3 hours
- ME 5550 - Intermediate Dynamics **Credits:** 3 hours
- ME 5580 - Mechanical Vibrations **Credits:** 3 hours
- ME 5640 - Engineering Noise Control **Credits:** 3 hours (L)

Mechanical Engineering Electives (PROPOSED)

Students must complete a total of *five different* elective courses from the list below (Group 1 and/or Group 2). Two must be design courses (marked with a "D" in the list) and two must have a laboratory experience (marked with an "L" in the list).

Group 1: Electives from Undergraduate Courses

Note: A minimum "C" grade is required in all prerequisites to Group 1 electives

- AE 3610 - Aerodynamics I (L) **Credits:** 4 hours
- ME 3670 - Internal Combustion Engines I (L) **Credits:** 3 hours
- ME 4330 - Environmental Systems Design in Buildings (D) **Credits:** 3 hours
  This course has a prerequisite that is an elective.
- ME 4390 - Design of Thermal Systems (D, L) **Credits:** 3 hours
  This course has a prerequisite that is an elective.
- AE 4660 - Aeronautical Propulsion Systems (L) **Credits:** 4 hours
- ME 4680 - Engine Design (D, L) **Credits:** 3 hours
  This course has a prerequisite that is an elective.
- ME 4530 - Machine Design II (D) **Credits:** 3 hours
- ME 4570 - Experimental Solid Mechanics (L) **Credits:** 3 hours
- AE 4630 - Aerospace Structural Design (D) **Credits:** 4 hours
- AE 4690 - Aircraft Design (D) **Credits:** 3 hours
- ME 4700 - Vehicle Structural Design (D) **Credits:** 3 hours
- AE 4600 - Aircraft Stability and Control **Credits:** 3 hours
- ME 4590 - Dynamics of Machinery **Credits:** 3 hours

- ME 4650 - Vehicle Dynamics **Credits:** 3 hours
- ME 4710 - Motion and Control (L) **Credits:** 3 hours
- ME 4810 - Vehicle Design (D, L) **Credits:** 3 hours
- ME 3990 - Cooperative Education (Repeatable 3 times to count as one elective 3 credit course) **Credits:** 1 hour

Group 2: Electives from Graduate Courses (5000 level)

Note: A minimum "B" grade is required in all prerequisites to Group 2 electives

- ME 5300 – Theoretical and Computational Fluid Mechanics **Credits:** 3 hours
- ME 5390 - Advanced Thermal Design (D) **Credits:** 3 hours
- ME 5450 – Computational Fluid Dynamics I **Credits:** 3 hours
- ME 5710 - Gas Dynamics **Credits:** 3 hours
- ME 5720- Advanced Thermodynamics **Credits:** 3 hours
- ME 5770 – Fuel Cell and Alternative Energy (L) **Credits:** 3 hours
- ME 5200 – Orthopaedic Biomechanics **Credits:** 3 hours
- ME 5500 – Modern Engineered Materials (D) **Credits:** 3 hours
- ME 5530 - Advanced Product Engineering (D) **Credits:** 3 hours
  This course has a prerequisite that is an elective.
- ME 5610 – Finite Element Method **Credits:** 3 hours
- ME 5690 - Principles of Fatigue and Fracture **Credits:** 3 hours
- ME 5730 - Materials Selection in Design (D) **Credits:** 3 hours
- ME 5750 - Tribology - Principles and Applications **Credits:** 3 hours
- ME 5410 - Continuous System Modeling & Simulation **Credits:** 3 hours
- ME 5430 - Mechanical Systems Control **Credits:** 3 hours
- ME 5550 - Intermediate Dynamics **Credits:** 3 hours
- ME 5580 - Mechanical Vibrations **Credits:** 3 hours
- ME 5640 - Engineering Noise Control (L) **Credits:** 3 hours
- ME 5800 – System Modeling and Simulation **Credits:** 3 hours
- ME 5860 – System Identification **Credits:** 3 hours
- ME 5850 - Mechatronics **Credits:** 3 hours
- ME 5350 – Applied Spectroscopy **Credits:** 3 hours
- ME 5600 – Engineering Analysis **Credits:** 3 hours

- ME 5620 – Application of Numerical Methods in Engineering **Credits:** 3 hours

First Semester (17-18 hours)

- General Education Credits: 3 hours

- CHEM 1100 - General Chemistry I **Credits:** 3 hours
- Pre-engineering requirement
- CHEM 1110 - General Chemistry Laboratory I **Credits:** 1 hour
- Pre-engineering requirement
- IME 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

Select Either

- ENGL 1050 - Thought and Writing **Credits:** 4 hours
- or
- IME 1020 - Technical Communication **Credits:** 3 hours
- Pre-engineering requirement

Second Semester (17 hours)

- CS 1022 - Introduction to Engineering Computing II: Mathematical Software **Credits:** 1 hour
- or
- CS 1023 - Introduction to Engineering Computing III: Computer Programming **Credits:** 1 hour
- MATH 1230 - Calculus II **Credits:** 4 hours
- or
- MATH 1710 - Calculus II, Science and Engineering **Credits:** 4 hours
- Pre-engineering requirement
- ME 2500 - Materials Science **Credits:** 3 hours
- ME 2615 - Introduction to Mechanical Engineering **Credits:** 3 hours
- 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 Credits: 3 hours

The following courses are pre-engineering requirements.

- MATH 2720 - Multivariate Calculus and Matrix Algebra **Credits:** 4 hours
- ME 2320 - Thermodynamics I **Credits:** 3 hours
- ME 2560 - Statics **Credits:** 3 hours
- PHYS 2070 - University Physics II **Credits:** 4 hours
- PHYS 2080 - University Physics II Laboratory **Credits:** 1 hour

Fourth Semester (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

Select Either:

The following courses are pre-engineering requirements.

- CHEM 1120 - General Chemistry II **Credits:** 3 hours
- and
- CHEM 1130 - General Chemistry Laboratory II **Credits:** 1 hour
- OR
- PHYS 3090 - Introductory Modern Physics **Credits:** 4 hours
- and
- PHYS 3100 - Introductory Modern Physics Lab **Credits:** 1 hour

Fifth Semester (18 to 19 hours)

- *ME 4320 – Thermodynamics II Credits: 3 hours*
- ECE 2110 - Machines and Electronic Circuits **Credits:** 3 hours
- ME 3560 - Fluid Mechanics **Credits:** 3 hours
- ME 3580 - Mechanism Analysis **Credits:** 3 hours
- ME 3620 - Theory of Engineering Experimentation **Credits:** 3 hours
- ME 3650 - Machine Design I **Credits:** 3 hours

Sixth Semester (15 to 16 hours)

- ME Group 3 Elective Credits: 3 to 4 hours
- General Education Credits: 3 hours

- ME 3350 - Instrumentation **Credits:** 3 hours
- ME 3600 - Control Systems **Credits:** 3 hours

- ME 4310 - Heat Transfer **Credits:** 3 hours

Seventh Semester (13 to 15 hours)

- ME Group 2 Elective Credits: 3 hours
- ME Group 3 Elective Credits: 3 to 4 hours
- ME Group 3 Elective Credits: 3 to 4 hours
- General Education Credits: 3 hours

- ME 4790 - Mechanical and Aerospace Engineering Project Planning **Credits:** 1 hour

Eighth Semester (13 to 14 hours)

- ME Group 2 Elective Credits: 3 to 4 hours
- General Education Credits: 3 hours
- General Education Credits: 2 hours

- IME 3090 - Engineering Economy for Mechanical Engineers **Credits:** 2 hours
- ME 4800 - Mechanical and Aerospace Engineering Project **Credits:** 3 hours