Mechanical Engineering and Mechanics
Course and Curriculum Changes , November 2008

RCEAS: Mechanical Engineering & Mechanics

Proposed New Course

1. Proposed new course number and course description (as it will appear in course catalogue):

EMA 320 - Elements of Engineering Analysis (3)
A refresher course in mathematics and computational skills for graduate students away from academics. Review of algebra, trigonometry, calculus, linear algebra, differential equations. Basics of computing in C++ and Matlab. Introduction to numerical methods, and mathematical modeling of physical systems.

2. Instructional mode (lecture, recitation, laboratory, seminar, independent study, or other) and number of contact hours per week:

Online course via Distance Education office

3. Rationale for proposed new course:

A good number of our Distance Ed students are rusty on their math and computational skills and are not ready to perform well in our regular graduate courses which heavily utilize mathematics and computation. Examples of such courses are: ME 452 (Mathematical Methods), ME 413 (Numerical Methods), ME 423 (Heat & Mass Transfer), ME 430 (Advanced Fluid Mechanics). This course will prepare our students and also familiarize them with Lehigh's computational environment.

The course has been successfully taught several times since Fall 2006.

4. Academic impact on programs affected by new course:

A. Is the proposed course to be cross-listed?

No

B. Identify any known effects of the proposed new course on other programs at the University.

None.

C. If there are known effects, individuals in charge of the affected programs must be consulted about the proposed new course and the following information provided:

(1) Who was consulted?

(2) Is the proposed new course acceptable to all other programs affected?

(3) Will any changes be required in the affected programs? If so, please describe below:

D. Does the proposed new course affect the University's commitment to diversity in any way? If so, please describe below:

No. But it will help to recruit older working engineers to our graduate program.

5. Resource Impact

A. Provide impact statements in the four areas listed below:

(1) Library impact statement (attach statement if provided by LTS)

None.

(2) Computer impact statement (attach statement if provided by LTS)

Negligible increase in the remote use of our computation facilities. Most students use their own systems for computations.

(3) Faculty impact statement (how proposed program affects load on existing faculty or requires new faculty)

The course has been taught several times. Distance Ed office is ready for handling this course.

(4) Facilities impact statement (how proposed program affects load on existing facilities or requires new facilities)

No impact.

B. Provide a statement indicating who will assume financial responsibility for any new resources required:

No new resources are required.

RCEAS: Mechanical Engineering & Mechanics

Proposed New Course

1. Proposed new course number and course description (as it will appear in course catalogue):

ME 255 – Introduction to Aerospace Engineering (3)
Properties of the atmosphere, aircraft design and performance basics including estimation of lift and drag of aerodynamic bodies. Concepts of stall and service ceiling of aircraft along with propulsive forces, stability and control.

Prerequisites: PHY 11 and ME104, and Co-requisite or Pre-requisite ME231.

2. Instructional mode (lecture, recitation, laboratory, seminar, independent study, or other) and number of contact hours per week:

Lecture and some laboratories. The course lectures shall comprise of three hourly lectures every week. Field trips will be arranged as appropriate to expose students to Aerospace opportunities.

3. Rationale for proposed new course:

This required course is the first one that will be taken by all students doing a minor in Aerospace Engineering. It introduces the students to the essential basics such as the nature of atmosphere, basics of aerodynamics, airfoils and wings, supersonic effects, astronautics as well as performance metrics related to stability and control, propulsion, structures and materials. The course forms a common starting focal point for Aerospace minor students and such a starting point is essential to orient the uninitiated student in the right direction. The course has already been taught and is being formalized now.

4. Academic impact on programs affected by new course:

A. Is the proposed course to be cross-listed?

NO.

B. Identify any known effects of the proposed new course on other programs at the University.

NO.

C. If there are known effects, individuals in charge of the affected programs must be consulted about the proposed new course and the following information provided:

(1) Who was consulted?

(2) Is the proposed new course acceptable to all other programs affected?

(3) Will any changes be required in the affected programs? If so, please describe below:

D. Does the proposed new course affect the University's commitment to diversity in any way? If so, please describe below:

NO.

5. Resource Impact

A. Provide impact statements in the four areas listed below:

(1) Library impact statement (attach statement if provided by LTS)

None.

(2) Computer impact statement (attach statement if provided by LTS)

None

(3) Faculty impact statement (how proposed program affects load on existing faculty or requires new faculty)

ME department has dedicated the time of a Professor of Practice for this course and other Aerospace initiatives.

(4) Facilities impact statement (how proposed program affects load on existing facilities or requires new facilities)

None.

B. Provide a statement indicating who will assume financial responsibility for any new resources required:

No new resources will be required.

RCEAS: Mechanical Engineering & Mechanics

Proposed New Course

1. Proposed new course number and course description (as it will appear in course catalogue):

ME 309 (MAT 309) – Composite Materials (3)
Principles and technology of composite materials. Processing, properties, and structural applications of composites, with emphasis on fiber-reinforced polymers.

Prerequisites: MAT 33 or equivalent, MECH 3.

2. Instructional mode (lecture, recitation, laboratory, seminar, independent study, or other) and number of contact hours per week:

Lecture and some laboratories. Regularly three sections of the course (on campus, satellite, and online) will be taught.

3. Rationale for proposed new course:

The course exists as MAT 309. The intent of the new ME number is proper cross listing of the course. We hope to increase the visibility of it to our undergraduate students as well as to our on-campus and Distance Ed graduate students.
The course is taught by a team consisting of one faculty from Material Sciences and Engineering and one faculty from our department. The course has been taught several times under a temporary MEM number

4. Academic impact on programs affected by new course:

A. Is the proposed course to be cross-listed?

Yes. With MAT 309. Prof. Charley Lyman of Materials Dept. has been kept updated.

B. Identify any known effects of the proposed new course on other programs at the University.

None.

C. If there are known effects, individuals in charge of the affected programs must be consulted about the proposed new course and the following information provided:

(1) Who was consulted?

(2) Is the proposed new course acceptable to all other programs affected?

(3) Will any changes be required in the affected programs? If so, please describe below:

D. Does the proposed new course affect the University's commitment to diversity in any way? If so, please describe below:

No.

5. Resource Impact

A. Provide impact statements in the four areas listed below:

(1) Library impact statement (attach statement if provided by LTS)

None.

(2) Computer impact statement (attach statement if provided by LTS)

None

(3) Faculty impact statement (how proposed program affects load on existing faculty or requires new faculty)

None, because the course is already being taught. We are cross listing the course.

(4) Facilities impact statement (how proposed program affects load on existing facilities or requires new facilities)

None.

B. Provide a statement indicating who will assume financial responsibility for any new resources required:

No new resources will be required.

College NAME: Mechanical Engineering & Mechanics

Proposed New Course

1. Proposed new course number and course description (as it will appear in course catalogue):

ME 333 Propulsion Systems
Review of jet and rocket engine technologies. Jet and rocket engine thermodynamic and aerodynamic principles. Performance of turbojet, turbofan, and turboprop jet engines. Rocket engines include liquid, cryogenic, solid, and electric propulsion.

Prerequisite: ME 104 Thermodynamics and either MECH 326 Aerodynamics or ME 322 Gas Dynamics.

2. Instructional mode (lecture, recitation, laboratory, seminar, independent study, or other) and number of contact hours per week:

Lecture, two 75-minute lectures per week

3. Rationale for proposed new course:

Expands course content for the Aerospace Minors

4. Academic impact on programs affected by new course:

A. Is the proposed course to be cross-listed?
N/A

B. Identify any known effects of the proposed new course on other programs at the University.
None

C. If there are known effects, individuals in charge of the affected programs must be consulted about the proposed new course and the following information provided:

(1) Who was consulted?

(2) Is the proposed new course acceptable to all other programs affected?

(3) Will any changes be required in the affected programs? If so, please describe below:

D. Does the proposed new course affect the University's commitment to diversity in any way? If so, please describe below:

No

5. Resource Impact

A. Provide impact statements in the four areas listed below:

(1) Library impact statement (attach statement if provided by LTS)

None

(2) Computer impact statement (attach statement if provided by LTS)

None

(3) Faculty impact statement (how proposed program affects load on existing faculty or requires new faculty)

ME department has dedicated the time of a Professor of Practice for this course and other Aerospace initiatives.

(4) Facilities impact statement (how proposed program affects load on existing facilities or requires new facilities)

None

B. Provide a statement indicating who will assume financial responsibility for any new resources required:

None required

RCEAS: Mechanical Engineering & Mechanics

Proposed New Course

1. Proposed new course number and course description (as it will appear in course catalogue):

ME 364 – Renewable Energy (3)

Fundamentals and design aspects of Renewable Energy (RE) technologies; bio-fuels, hydropower, solar photovoltaic, solar thermal, wind, geothermal energies. Details and difficulties in implementing RE.

Prerequisites: Math 205, ME104, ME231 and/or senior standing in Engineering.

2. Instructional mode (lecture, recitation, laboratory, seminar, independent study, or other) and number of contact hours per week:

Lecture and some laboratories. The course lectures shall comprise of three hourly lectures (on campus, satellite, and online) every week. Field trips will be arranged as appropriate to expose students to RE opportunities.

3. Rationale for proposed new course:

Increase in the price of fossil fuels, the impending shortage of such fuels and the realization that manmade Green House gas (GHG) effects could affect the planet has brought on a great deal of interest in Renewable Energy (RE). There is thus need for Mechanical Engineering majors to learn the fundamentals related to RE. This will be an important course in the Energy Minor for ME majors. The RE course also matches the college and University wide thrusts and objectives (such as STEPS) to move forward toward greener energy matters.

4. Academic impact on programs affected by new course:

A. Is the proposed course to be cross-listed?

Yes, possibly as ChE 3XX.

B. Identify any known effects of the proposed new course on other programs at the University.

No.

C. If there are known effects, individuals in charge of the affected programs must be consulted about the proposed new course and the following information provided:

(1) Who was consulted?

(2) Is the proposed new course acceptable to all other programs affected?

(3) Will any changes be required in the affected programs? If so, please describe below:

D. Does the proposed new course affect the University's commitment to diversity in any way? If so, please describe below:

No.

5. Resource Impact

A. Provide impact statements in the four areas listed below:

(1) Library impact statement (attach statement if provided by LTS)

None.

(2) Computer impact statement (attach statement if provided by LTS)

None

(3) Faculty impact statement (how proposed program affects load on existing faculty or requires new faculty)

The ME/Mech department has made a conscious decision to divert manpower to make this course and a Minor in Energy possible.

(4) Facilities impact statement (how proposed program affects load on existing facilities or requires new facilities)

None.

B. Provide a statement indicating who will assume financial responsibility for any new resources required:

No new resources will be required.

RCEAS: Mechanical Engineering & Mechanics

Proposed New Course

1. Proposed new course number and course description (as it will appear in course catalogue):

ME 366 . Engineering Principles of Clean Coal Technology (3)

Effect of coal properties on plant performance. Design and performance of coal-based electric power generation systems. Technologies to control emissions. Carbon capture and sequestration methods for coal-fired power plants and analysis of CCS options.
Prerequisites: ME 104 or equivalent and Junior standing in engineering or physical science.

2. Instructional mode (lecture, recitation, laboratory, seminar, independent study, or other) and number of contact hours per week:

Lecture and some laboratories. Lecture format (three 50 minute per week) with homework and student projects.

3. Rationale for proposed new course:

Recent concern about the level of CO2 in our atmosphere and the fact that U.S. has abundant supplies of coal have brought on renewed interest in clean coal technologies. This course will be part of a minor in energy engineering being offered by the ME/Mech department.

4. Academic impact on programs affected by new course:

A. Is the proposed course to be cross-listed?

No.

B. Identify any known effects of the proposed new course on other programs at the University.

NO.

C. If there are known effects, individuals in charge of the affected programs must be consulted about the proposed new course and the following information provided:

(1) Who was consulted?

(2) Is the proposed new course acceptable to all other programs affected?

(3) Will any changes be required in the affected programs? If so, please describe below:

D. Does the proposed new course affect the University's commitment to diversity in any way? If so, please describe below:

NO.

5. Resource Impact

A. Provide impact statements in the four areas listed below:

(1) Library impact statement (attach statement if provided by LTS)

None.

(2) Computer impact statement (attach statement if provided by LTS)

None

(3) Faculty impact statement (how proposed program affects load on existing faculty or requires new faculty)

The ME/Mech department has made a conscious decision to divert manpower to make this course and a Minor in Energy possible.

(4) Facilities impact statement (how proposed program affects load on existing facilities or requires new facilities)

None.

B. Provide a statement indicating who will assume financial responsibility for any new resources required:

No new resources will be required.

RCEAS: Mechanical Engineering & Mechanics

Proposed New Course

1. Proposed new course number and course description (as it will appear in course catalogue):

ME 362 Nuclear Fusion and Radiation Protection

Structure of the nucleus. Quantum theory. Nuclear energy release: Fission vs. Fusion. Plasma for fusion. Power balances in fusion plasmas. Magnetic and inertial confinement fusion concepts. Magnetic equilibrium configurations and limitations. The Tokamak. Emerging and alternative concepts. Fusion reactor economics. Radiation sources and Radioactive decay. Interactions of radiation with matter, detectors and protection from radiation. Energy deposition and dose calculations. Applications in dosimetry, imaging and spectroscopy.

Prerequisites: Senior standing in engineering or physical science

2. Instructional mode (lecture, recitation, laboratory, seminar, independent study, or other) and number of contact hours per week:

Lecture and some laboratories. The course lectures shall comprise of three hourly lectures every week.

3. Rationale for proposed new course:

The advent of Fusion energy is closer than ever. The international investment and emphasis on ITER have heightened the interest in fusion nuclear energy. When perfected fusion energy can lead to the availability of a vast amount of energy and thus make electricity much less expensive and students are interested in learning more about such technologies. This course will be part of the Minor in Energy Engineering being offered by the ME/Mech department.

4. Academic impact on programs affected by new course:

A. Is the proposed course to be cross-listed?

No

B. Identify any known effects of the proposed new course on other programs at the University.

No.

C. If there are known effects, individuals in charge of the affected programs must be consulted about the proposed new course and the following information provided:

(1) Who was consulted?

(2) Is the proposed new course acceptable to all other programs affected?

(3) Will any changes be required in the affected programs? If so, please describe below:

D. Does the proposed new course affect the University's commitment to diversity in any way? If so, please describe below:

NO.

5. Resource Impact

A. Provide impact statements in the four areas listed below:

(1) Library impact statement (attach statement if provided by LTS)

None.

(2) Computer impact statement (attach statement if provided by LTS)

None

(3) Faculty impact statement (how proposed program affects load on existing faculty or requires new faculty)

The ME/Mech department has made a conscious decision to divert manpower to make this course and a Minor in Energy possible.

(4) Facilities impact statement (how proposed program affects load on existing facilities or requires new facilities)

None.

B. Provide a statement indicating who will assume financial responsibility for any new resources required:

No new resources will be required.

RCEAS: Mechanical Engineering

Proposed New Course

1. Proposed new course number and course description (as it will appear in course catalogue):

ME 376 (ChE 376) Energy: Issues & Technology (3)

Energy usage and supply, fossil fuel technologies, renewable energy alternatives and environmental impacts. The scope will be broad to give some perspective of the problems, but in-depth technical analysis of many aspects will also be developed.

Prerequisites: college-level introductory courses in chemistry, physics and mathematics and instructor approval

2. Instructional mode (lecture, recitation, laboratory, seminar, independent study, or other) and number of contact hours per week:

The instructional mode will include a lecture format meeting twice a week, 75 minutes each.

3. Rationale for proposed new course:

The proposed course has been taught once in Spring 2008 (36 students) and will be offered in Spring 2009 under ChE 350 Special Topics. The Department believes that it is time to make the course permanent.

4. Academic impact on programs affected by new course:

A. Is the proposed course to be cross-listed?

ChE 376 Energy: Issues & Technology (3)

B. Identify any known effects of the proposed new program on other programs at the University.

None that we can anticipate

C. If there are known effects, individuals in charge of the affected programs must be consulted about the proposed new program and the following information provided:

(1) Who was consulted?

N/A

(2) Is the proposed new program acceptable to all other programs affected?

N/A

(3) Will any changes be required in the affected programs? If so, please describe below:

NO

D. Does the proposed new program affect the University's commitment to diversity in any way? If so, please describe below:

N/A

5. Resource Impact:

A. Provide impact statements in the four areas listed below:

(1) Library impact statement (attach statement if provided by LTS)

The course has already been offered under Special Topics, thus there will be no additional impact on Library

(2) Computer impact statement (attach statement if provided by LTS)

Given that this course has been taught under Special Topics, no new computer impact is expected

(3) Faculty impact statement (how proposed program affects load on existing faculty or requires new faculty)

The course will continue to be offered by ChE Department as an elective to both Undergraduate and Graduate students. Frequency of the offering will depend on anticipated need and Departmental load.

(4) Facilities impact statement (how proposed program affects load on existing facilities or requires new facilities)

This proposal has no new impact on facilities since the course has currently been offered under Special Topics.

B. Provide a statement indicating who will assume financial responsibility for any new resources required:

Course has already been offered by ChE Department. Department will be responsible for any new resources required.

RCEAS: Mechanical Engineering & Mechanics

Proposed Program Changes

Minor in Aerospace Engineering

Name and summary of current program: Minor in Aerospace Engineering
The minor in aerospace engineering provides a foundation for students who intend to pursue a career in the aerospace industry. This minor will also provide sufficient technical background in aerospace studies for undergraduates who plan to enter graduate programs in this field. The minor requires a minimum of 17 credits from the following course selection:

Required Courses	
MECH 326	Aerodynamics (3)
MECH 305	Advanced Mechanics of Materials (3)
ME 343	Control Systems (3)
MECH 328	Fundamentals of Aircraft Design (3)
Elective Courses	
ME 322	Gas Dynamics (3)
ME 323	Reciprocating and Centrifugal Engines (3)
ME 331	Advanced Fluid Mechanics (3)
ME 389	Controls Laboratory (2)
MECH 312	Finite Element Analysis (3)
ME 348	Computer-Aided Design (3)
ME 309 (MAT 309)	Composite Materials (3)

Proposed program changes (as they will appear in the catalog):
The minor in aerospace engineering provides a foundation for students who intend to pursue a career in the aerospace industry. This minor will also provide sufficient technical background in aerospace studies for undergraduates who plan to enter graduate programs in this field. The minor requires a minimum of 15 credits from the following course selection:

Required Courses	
ME 255	Introduction to Aerospace Eng. (3)
MECH 326	Aerodynamics (3)
MECH 328	Fundamentals of Aircraft Design (3)
Elective Courses	
ME 322	Gas Dynamics (3)
ME 331	Advanced Fluid Mechanics (3)
MECH 312	Finite Element Analysis (3)
MECH 305	Advanced Mechanics of Materials (3)
ME 348	Computer-Aided Design (3)
ME 309	Composite Materials (3)
ME 343	Control Systems (3)
ME 333	Propulsion Systems (3)

Description of proposed change(s):
The total number of credits is 15 credits consistent with other minors. ME 255 Introduction to Aerospace Eng, ME 326 Aerodynamics and MECH 328 Aircraft Design are now required courses. The electives have been streamlined with better focus on topics of interest to the minor. MECH 305 Advanced Mechanics of Materials and ME 343 Control Systems are removed from the required list of courses. ME 255 is a new introductory course and ME309 is a newly cross listed (with MAT 309) course.

Rationale for proposed change(s):
The set of requirements for the minor better related to the objectives of the Aerospace minor and is now feasible thanks to the new courses. The new set of courses increases the topics that are fundamental in aerospace design.

Academic Impact:

Is this proposed new program interdisciplinary? No

Identify any known effects of the proposed new program on other programs at the University. None

If there are known effects, individuals in charge of the affected programs must be consulted about the new program and the following information provided:

Who was consulted? N/A

Is the proposed new program acceptable to all programs affected? N/A

Will any changes be required in the affected programs? If so, describe. N/A

Identify any known effects of the proposed new program on the University's commitment to diversity. No known effects on diversity.

Resource Impact:

Provide each of the following:

Library impact statement: None

Computer impact statement: None

Faculty impact statement: None

Facilities impact statement: None

Provide a statement indicating who will assume financial responsibility for any new resources required: Department of Mechanical Engineering and Mechanics.

RCEAS: Mechanical Engineering & Mechanics

Proposed New Program

Minor in Energy Engineering

1. Proposed new program mission statement:
The minor in energy engineering provides a foundation for students who intend to pursue a career in the area energy and associated industries. This minor will also provide sufficient technical background in energy area for undergraduates who plan to enter graduate programs in related fields. The minor requires a minimum of 15 credits from the following course selection:

2. Rationale for proposed new program:
Thanks to the higher potential costs of fossil fuels, their impact on the environment and implication of energy imports on the security, energy engineering is an area that is likely to get a great deal of attention. The Minor in energy engineering is intended primarily for Mechanical Engineering majors and its introduction now is a recognition of fast growing student interest based on the national focus on energy its generation, conservation and use.

3. Description of proposed new program:
The minor in energy engineering touches upon the technologies associated with the transformation and use of energy in various forms. Since every sector of engineering and the economy require energies of one form or another, the courses included in this minor program will permit student exposure to fossil, nuclear and renewable energy technologies. The mechanical engineering curriculum provides the fundamental knowledge in thermodynamics, fluid mechanics and other related areas leading up to the courses for the energy engineering minor. The courses offer a wide variety of topics including fundamental, analytical and design aspects energy conservation as well as various forms of energy used in power generation, transportation and industry. The minor energy engineering requires a minimum of 15 credits, which must be taken from MEM offerings. The minor in energy is primarily intended for ME majors but students with other majors, particularly Chemical engineering will be able to take some or all the related courses. Four courses are requires with some degree of choice and an additional course must be selected from a broader set.

Required course:

ME 304 Thermodynamics II (3)

Elective Energy Courses:
Choose at least three courses from the below four
ME 360 Nuclear Energy (3)
ME 364 Renewable Energy (3)
ME 362Nuclear Fusion and Radiation Protection (3)
ME 366 Engineering Principles of Clean Coal Technology (3)

Additional Electives:

ChE/ME 376	Energy: Issues and Technology (3)
ME 331	Advanced Fluid Mechanics (3)
ME 322	Gas Dynamics (3)
ME 343	Control System (3)
ChE 373	Fundamentals of Air Pollution (3)

OR other Energy related 300 level courses with the approval of the ME Dept. Chair.

Details of the Proposed Program (any information not supplied elsewhere on this form but important to the consideration of the proposed program)

The ChE376 course is to be formalized and will be cross listed as ME 376.

Chemical engineering may cross list the ME 364 Renewable Energy course

Implementation Plan (how the minor will be put into place) Four of the course needed for the minor will be in place as of Spring 2009 semester. Students will be able to complete the minor requirements with departmental approval by taking other existing electives. It is anticipated that new faculty hires will be those with interests in areas related to this minor thus providing a routine set of courses for the students to be able choose courses and complete the minor requirements.

4. Academic Impact Statement:

Is the proposed new program interdisciplinary?

There are two courses in the minor that are interdisciplinary; ChE/ME 376 Energy: Issues and Technology that is being formalized. ME364 Renewable energy course may soon be cross-listed as ChE 364 also. Students outside the Department of Mechanical Engineering and Mechanics will need planning to subscribe to this minor and will render an interdisciplinary minor for them in this very fast growing area.

Identify any known effects of the proposed new program on other programs at the University.

The effect of cross-listings described above will be incidental.

If there are known effects, individuals in charge of the affected programs must be consulted about the proposed new program and the following information provided:

Who was consulted? The Associate Chair of Chemical Engineering has been kept abreast of this new minor program.

Is the proposed new program acceptable to all other programs affected? N/A

Will any changes be required in the affected programs? If so, please describe below: No

Does the proposed new program affect the University's commitment to diversity in any way? If so, please describe below. No known effects on diversity.

5. Resource Impact

Provide each of the following:

Library impact statement None

Computer impact statement None

Faculty impact statement This minor requires existing courses and new courses to be taught with adjustment of existing faculty loads.

Facilities impact statement The anticipated new faculty hires will make the minor stronger.

Provide a statement indicating who will assume financial responsibility for any new resources required:

Department of Mechanical Engineering and Mechanics