Engineering Faculty Council
Meeting Agenda
September 26, 2017
11:00 a.m.
202 Hammond Building (Stavely Conference Room)

1. Approval of minutes for the meeting of August 22, 2017
2. Dean’s Report
3. Updates from Undergraduate Studies Committee
4. Updates from Graduate Studies Committee
   - No updates
5. Updates from Engineering Technology Committee
   - No updates
6. Updates from Faculty Senate
7. Other Business
1. Approval of minutes for the previous EFC meeting on April 18th, 2017. **Unanimously approved.**

2. Dean's Report (Justin Schwartz)
   - The EFC welcomed the new Dean, Justin Schwartz.
   - An update was provided on new rules governing Greek organizations (fraternities and sororities). The local chapter of Beta Theta Pi has been disbanded, although certain members continue to reside in the residence. The State College Borough municipal government is involved in determining the outcome, which may further affect reform of the Penn State Greek system.
   - An update was provided on the effort to unionize graduate students. Faculty and staff are asked to visit [http://gradfacts.psu.edu](http://gradfacts.psu.edu) to obtain additional information and answers to frequently asked questions.

3. Updates from the Undergraduate Studies Committee
   - Course changes were proposed for the following undergraduate courses: CMPSC 131. CMPSC 132. CMPSC 221. Related updates to CMPSC program descriptions and curriculum ordering.
     - CHE210. CHE210H. CHE220. CHE220H. CHE450. CHE452. CHE480M. CHE480W. Related updates to the CHE program descriptions, the elimination of Options that had low enrollments, and changes to the list of acceptable technical & technical emphasis electives. **All course changes were unanimously approved.**

4. Updates to Career Progression for Non-Tenure Track Faculty (Rebecca Mason)
   - An update was provided on the College-wide and University-wide effort to provide a clear route to career progression for non-tenured faculty. There are a series of new titles for non-tenured track faculty that specialize in Teaching, Research, or Clinical practices. New committees have been formed and staffed to determine Promotion and Tenure decisions. This effort was developed to increase the retention of performant non-tenure track faculty with clearer merit-based promotions and titles.

5. Updates from Graduate Studies Committee
   No items to report.

6. Updates from Engineering Technology Committee (Jennilyn Vallejera)
The Engineering Technology committee recently had their ETCE meeting on August 14th, and 18 programs will go for accreditation next year (2 BET, 2 EET (3 campuses), 2 MET (3 campuses), 2 SRT, EMET (4 campuses), as well as SUR E).

7. Updates from Faculty Senate (Doug Wolfe)
No items to report.
SENATE COMMITTEE ON CURRICULAR AFFAIRS
COURSE SUBMISSION AND CONSULTATION FORM

Principal Faculty Member(s) Proposing Course

<table>
<thead>
<tr>
<th>Name</th>
<th>User ID</th>
<th>College</th>
<th>Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robert Melton</td>
<td>r81</td>
<td>Engineering (EN)</td>
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</tbody>
</table>

Academic Home: Engineering (EN)
Type of Proposal: [X] Add [ ] Change [ ] Drop

Course Designation
(AERSP 397) Special Topics

Course Information

Cross-Listed Courses:

Prerequisites:

Corequisites:

Concurrents:

Recommended Preparations:

Abbreviated Title: Special Topics
Discipline: None
Course Listing:

Special categories for Undergraduate (001-499) courses

Foundations
- Writing/Speaking (GWS)
- Quantification (GQ)

Knowledge Domains
- Health & Wellness (GHW)
- Natural Sciences (GN)
- Arts (GA)
- Humanities (GH)
- Social and Behavioral Sciences (GS)

Additional Designations
- Bachelor of Arts
- International Cultures (IL)
- United States Cultures (US)
- Honors Course
- Common course number - x94, x95, x96, x97, x99
- Writing Across the Curriculum

First-Year Engagement Program
- First-Year Seminar

Miscellaneous
Course Outline

A brief outline or overview of the course content:
Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.

A listing of the major topics to be covered with an approximate length of time allotted for their discussion:
Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.

Course Description:
Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.

The name(s) of the faculty member(s) responsible for the development of the course:
Name: Robert Melton (r81)
Title: PROF AEROSPACE ENGR
Phone: +1 814 865 1185
Address: 0229 HAMMOND BLDG
Campus: UP
City: UNIVERSITY PARK
Fax:

Course Justification

Instructional, Educational, and Course Objectives:
This section should define what the student is expected to learn and what skills the student will develop.
Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.

Evaluation Methods:
Include a statement that explains how the achievement of the educational objective identified above will be assessed. The procedures for determining students' grades should be specifically identified.
Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.

Relationship/Linkage of Course to Other Courses:
This statement should relate the course to existing or proposed new courses. It should provide a rationale for the level of instruction, for any prerequisites that may be specified, or for the course's role as a prerequisite for other courses.
Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Relationship of Course to Major, Option, Minor, or General Education:
This statement should explain how the course will contribute to the major, option, or minor and indicate how it may function as a service course for other departments.
Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.

A description of any special facilities:
Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.

Frequency of Offering and Enrollment:
Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.

Campuses That Have Offered ( ) Over The Past 4 Years
| semester | AB | AL | BK | BR | BW | CR | DS | ER | FE | GA | GV | HB | HN | HY | LV | MA | NK | PC | SH | SL | UP | WB | WC | WS | XC | XP | XS | YK |

Review History
This section represents all consultation history that has occurred on this proposal

Legend
- Approve
- Rejected
- Waiting Review
- User Action Required
- Pending Action(s)
- Moved to Rejected Status
- Approved
- (#) - Review Order Sequence Number

Head of Department

Recipient Name: PHILIP MORRIS
Position: Head of Department
Title:
Concur: [Not Yet Reviewed]
Comments: [Not Yet Reviewed]
Reviewed On: [Not Yet Reviewed]

SCCA Representative

Recipient Name: ROBERT MELTON
Position: SCCA Representative
Title:
Concur: [Not Yet Reviewed]
Comments: [Not Yet Reviewed]
Reviewed On: [Not Yet Reviewed]

Dean of the College

Recipient Name: PETER BUTLER
Position: Dean of the College
Title:
Concur: [Not Yet Reviewed]
Comments: [Not Yet Reviewed]
Reviewed On: [Not Yet Reviewed]
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**Title:** 

**Concur:** [Not Yet Reviewed]  
**Comments:** [Not Yet Reviewed]  
**Reviewed On:** [Not Yet Reviewed]

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**Curricular Information**

Blue Sheet Item #:

Review Date:

**SCRID Numbers**

(AERSP 397):
SENATE COMMITTEE ON CURRICULAR AFFAIRS
COURSE SUBMISSION AND CONSULTATION FORM

**Principal Faculty Member(s) Proposing Course**

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<td>MNM11</td>
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<tr>
<td>VIRENDRA PURI</td>
<td>v7p</td>
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**Academic Home:** Engineering (EN)

**Type of Proposal:** [ ] Add [ ] Change [ ] Drop

- I am requesting recertification of this course for the new Gen Ed and/or University Requirements Guidelines?

**Course Designation**

(BE 301) Mathematical Modeling of Biological and Physical Systems

**Course Information**

**Cross-Listed Courses:**

**Prerequisites:**

MATH 251

**Corequisites:**

**Concurrents:**

**Recommended Preparations:**

**Abbreviated Title:** Math Mod Biophys S

**Discipline:** None

**Course Listing:**

**Special categories for Undergraduate (001-499) courses**

**Foundations**

- [ ] Writing/Speaking (GWS)
- [ ] Quantification (GQ)

**Knowledge Domains**

- [ ] Health & Wellness (GHW)
- [ ] Natural Sciences (GN)
- [ ] Arts (GA)
- [ ] Humanities (GH)
- [ ] Social and Behavioral Sciences (GS)

**Additional Designations**

- [ ] Bachelor of Arts
- [ ] International Cultures (IL)
- [ ] United States Cultures (US)
- [ ] Honors Course
- [ ] Common course number - x94, x95, x96, x97, x99
- [ ] Writing Across the Curriculum

**First-Year Engagement Program**
Course Outline

A brief outline or overview of the course content:

A listing of the major topics to be covered with an approximate length of time allotted for their discussion:

Course Description:
The ability to quantify relationships into mathematical models, and implement the models into the computer to find solutions, is essential for engineering analysis and design. This course provides the student with tools for modeling biological and physical systems. Upon completion of this course, the student will be able to: identify a process/system and represent that process/system mathematically; solve the mathematically-represented system using computer-based modeling tools, such as Excel and MATLAB; describe the emphasis areas offered in the Biological Engineering major; and be able to develop a systems model related to each area. The course includes engineering economics, matrix operations, curve fitting, numerical integration and differentiation, linear and non-linear systems of equations, and applications of these methods to biological and agricultural systems.

The name(s) of the faculty member(s) responsible for the development of the course:

- Name: MEGAN MARSHALL (MNM11)
  Title: INSTR AG & BIO ENG
  Phone: +1 814 865 3392
  Address: 0224 AG ENGR BLDG
  Campus: UP
  City: UNIVERSITY PARK
  Fax:

- Name: VIRENDRA PURI (v7p)
  Title: DIST PROF AG ENGINEERING
  Phone: +1 814 865 3559
  Address: 229 AG ENGR BLDG
  Campus: UP
  City: UNIVERSITY PARK
  Fax:

Course Justification

Instructional, Educational, and Course Objectives:
This section should define what the student is expected to learn and what skills the student will develop.

**Evaluation Methods:**
Include a statement that explains how the achievement of the educational objective identified above will be assessed. The procedures for determining students' grades should be specifically identified.

**Relationship/Linkage of Course to Other Courses:**
This statement should relate the course to existing or proposed new courses. It should provide a rationale for the level of instruction, for any prerequisites that may be specified, or for the course's role as a prerequisite for other courses.

**Relationship of Course to Major, Option, Minor, or General Education:**
This statement should explain how the course will contribute to the major, option, or minor and indicate how it may function as a service course for other departments.

BE 301 is a required course for all students in the Biological Engineering (BE) major.

A description of any special facilities:
STEC room for lecture and labs

**Frequency of Offering and Enrollment:**
Every fall semester with 50 students

**Justification for Changing The Proposal:**
Include a justification for each change to the course. Particular attention should be paid to the effects of the course change within the discipline and in other disciplines where the course may be required within a major or used as a service course. When a unit submits several course changes, with or without new course proposals, a general statement covering the programmatic effects of the changes should be submitted.

The course content of BE 301 is not changing. The proposed change is to make MATH 251 (differential equations) a prerequisite to BE 301 as opposed to allowing MATH 251 prerequisite or concurrent. One topic of BE 301 is numerical integration of differential equations, which is introduced in week two of the course and then revisited throughout the semester. In order to be successful in BE 301, students should complete a differential equations course prior to the start of BE 301 since this preparation is needed at the beginning of the semester.

BE 301 is only taken by students in the Biological Engineering (BE) major; therefore, no external consultation was sought. This course change proposal was approved by the ABE Department Undergraduate Studies Committee and then approved by all the faculty.

### Campuses That Have Offered (BE 301) Over The Past 4 Years

| semester | AB | AL | BK | BR | BW | CR | DS | ER | FE | GA | GV | HB | HN | HY | LV | MA | NK | PC | SH | SL | UP | WB | WC | WS | XC | XP | XS | YK |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Fall 2017 | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ |
| Fall 2016 | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ |
| Fall 2015 | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ |
| Fall 2014 | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ |
| Fall 2013 | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ |

### Review History
This section represents all consultation history that has occurred on this proposal

**Legend**
- ✔️ Approve
- ✗ Rejected
- ✨ Waiting Review
- 🔃 User Action Required
- 🚨 Pending Action(s)
- ⚡ Moved to Rejected Status
- ✔️ Approved
- (#) - Review Order Sequence Number

### Consultation
- **Recipient Name:** Paul Heinemann
- **Department:** Agricultural And Biological Engineering
- **Position:** Consultation
- **Campus:** UNIVERSITY PARK CAMPUS
- **Title:** DEPT HD/PROF AG & BIO ENG
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<td>PAUL HEINEMANN</td>
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<td>SCCA Representative</td>
<td>ROBERT MELTON</td>
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<td>PETER BUTLER</td>
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Curricular Information

Blue Sheet Item #:
Review Date:

SCRID Numbers

(BE 301):

Reviewed On: [Not Yet Reviewed]
SENATE COMMITTEE ON CURRICULAR AFFAIRS
COURSE SUBMISSION AND CONSULTATION FORM

Principal Faculty Member(s) Proposing Course

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</table>

Academic Home: Engineering (EN)

Type of Proposal:  
- Add [ ]  
- Change [X]  
- Drop [ ]

I am requesting recertification of this course for the new Gen Ed and/or University Requirements Guidelines?

Course Designation
(BE 304) Engineering Properties of Food and Biological Materials

Course Information

Cross-Listed Courses:

Prerequisites:
( EMCH 210; EMCH 213 ), MATH 251

Corequisites:

Concurrents:
BE 301, ( CE 360; ME 320 )

Recommended Preparations:

Abbreviated Title: Food Bio Matl Prop
Discipline: None
Course Listing:

Special categories for Undergraduate (001-499) courses

Foundations

- Writing/Speaking (GWS)
- Quantification (GQ)

Knowledge Domains

- Health & Wellness (GHW)
- Natural Sciences (GN)
- Arts (GA)
- Humanities (GH)
- Social and Behavioral Sciences (GS)

Additional Designations

- Bachelor of Arts
- International Cultures (IL)
- United States Cultures (US)
- Honors Course
- Common course number - x94, x95, x96, x97, x99
- Writing Across the Curriculum
- First-Year Engagement Program
Course Outline

A brief outline or overview of the course content:

A listing of the major topics to be covered with an approximate length of time allotted for their discussion:

Course Description:
Engineering properties play a crucial role during the analysis, design, and synthesis phases of problem solving. The accurate knowledge of properties is essential to the precise determination of the overall system and component responses. Due to the time-dependent and environmentally-sensitive nature of properties of the agricultural, food, and biological materials, the theory and measurement systems are different from those used for conventional engineering materials and their systems. Therefore, the focus of this course is to provide the students with sound bases of the theory and measurement methods that are used to quantify physical, mechanical, thermal, biological, and chemical properties of products and their systems. In addition, the significance and importance of the inherent variation in the property values of agricultural, food, and biological materials is emphasized.

The name(s) of the faculty member(s) responsible for the development of the course:

Name: VIRENDRA PURI (v7p)
Title: DIST PROF AG ENGINEERING
Phone: 814-865-3559
Address: 229 AG ENGR BLDG
Campus: UP
City: UNIVERSITY PARK
Fax:

Course Justification

Instructional, Educational, and Course Objectives:
This section should define what the student is expected to learn and what skills the student will develop.

Evaluation Methods:
Include a statement that explains how the achievement of the educational objective identified above will be assessed. The procedures for determining students’ grades should be specifically identified.

Relationship/Linkage of Course to Other Courses:
This statement should relate the course to existing or proposed new courses. It should provide a rationale for the level
of instruction, for any prerequisites that may be specified, or for the course’s role as a prerequisite for other courses.

Relationship of Course to Major, Option, Minor, or General Education:
This statement should explain how the course will contribute to the major, option, or minor and indicate how it may function as a service course for other departments.
BE 304 is a required course for all students in the Biological Engineering (BE) major.

A description of any special facilities:

Frequency of Offering and Enrollment:
Every fall semester with 50 students

Justification for Changing The Proposal:
Include a justification for each change to the course. Particular attention should be paid to the effects of the course change within the discipline and in other disciplines where the course may be required within a major or used as a service course. When a unit submits several course changes, with or without new course proposals, a general statement covering the programmatic effects of the changes should be submitted.

The course content of BE 304 is not changing. The proposed change is to make MATH 251 (differential equations) a prerequisite to BE 304 as opposed to allowing MATH 251 prerequisite or concurrent. Three major topics of BE 304, Rheology, Heat and Mass Transport, and Microbiological Inactivation and Growth Characterization (~ 12 weeks) require solution of differential equations. In order to be successful in BE 304, students should complete a differential equations course prior to the start of BE 304 since this preparation is essential throughout the semester.

BE 304 is only taken by students in the Biological Engineering (BE) major; therefore, no external consultation was sought. This course change proposal was approved by the ABE Department Undergraduate Studies Committee and then approved by all the faculty.

Campuses That Have Offered (BE 304) Over The Past 4 Years

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Review History
This section represents all consultation history that has occurred on this proposal

Legend

- Approve
- Rejected
- Waiting Review
- User Action Required
- Pending Action(s)
- Moved to Rejected Status
- Approved
- (#) - Review Order Sequence Number

Consultation

Recipient Name: PAUL HEINEMANN
Department: Agricultural And Biological Engineering
Position: Consultation
Campus: UNIVERSITY PARK CAMPUS
Title: DEPT HD/PROF AG & BIO ENG

Request sent: 8/19/2017 at 10:00 PM
Concur: Yes
Comments: 
Reviewed On: 8/21/2017 at 8:56 AM
SCCA Review

**Recipient Name:** ALLISON ALBINSKI  
**Position:** SCCA Review  
**Department:** (Not Available)  
**Campus:** UNIVERSITY PARK CAMPUS

**Title:**

Concur: [Not Yet Reviewed]  
Comments: [Not Yet Reviewed]  
Reviewed On: [Not Yet Reviewed]

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SCCA Review

**Recipient Name:** KADI CORTER  
**Position:** SCCA Review  
**Department:** (Not Available)  
**Campus:** UNIVERSITY PARK CAMPUS

**Title:**

Concur: [Not Yet Reviewed]  
Comments: [Not Yet Reviewed]  
Reviewed On: [Not Yet Reviewed]

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Faculty Senate Review

**Recipient Name:** ALLISON ALBINSKI  
**Position:** Faculty Senate Review  
**Department:** (Not Available)  
**Campus:** UNIVERSITY PARK CAMPUS

**Title:**

Concur: [Not Yet Reviewed]  
Comments: [Not Yet Reviewed]  
Reviewed On: [Not Yet Reviewed]

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Faculty Senate Review

**Recipient Name:** KADI CORTER  
**Position:** Faculty Senate Review  
**Department:** (Not Available)  
**Campus:** UNIVERSITY PARK CAMPUS

**Title:**

Concur: [Not Yet Reviewed]  
Comments: [Not Yet Reviewed]  
Reviewed On: [Not Yet Reviewed]

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Curricular Information

Blue Sheet Item #:  
Review Date:
SCRID Numbers

(BE 304):
SENATE COMMITTEE ON CURRICULAR AFFAIRS
COURSE SUBMISSION AND CONSULTATION FORM

Principal Faculty Member(s) Proposing Course

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<th>Name</th>
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<tr>
<td>ANDREW ZYDNEY</td>
<td>ALZ3</td>
<td>Engineering (EN)</td>
<td>Not Available</td>
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Academic Home: Engineering (EN)
Type of Proposal: [X] Add [ ] Change [ ] Drop

Course Designation
(CHE 455) Drug Delivery, Pharmacokinetics, and Artificial Organs

Course Information
Cross-Listed Courses:

Prerequisites:
CHE 350, BME 409, BME 413, OR BE 302

Corequisites:

Concurrents:

Recommended Preparations:
CHE 410

Abbreviated Title: Drug Delivery
Discipline: None

Course Listing:

Special categories for Undergraduate (001-499) courses

Foundations
- [ ] Writing/Speaking (GWS)
- [ ] Quantification (GQ)

Knowledge Domains
- [ ] Health & Wellness (GHW)
- [ ] Natural Sciences (GN)
- [ ] Arts (GA)
- [ ] Humanities (GH)
- [ ] Social and Behavioral Sciences (GS)

Additional Designations
- [ ] Bachelor of Arts
- [ ] International Cultures (IL)
- [ ] United States Cultures (US)
- [ ] Honors Course
- [ ] Common course number - x94, x95, x96, x97, x99
- [ ] Writing Across the Curriculum
First-Year Engagement Program
- [ ] First-Year Seminar
Course Overview

CHE 455 is an elective course that examines the application of chemical engineering principles (thermodynamics, transport, and kinetics) to the analysis of a number of medically related issues. Specific topics include drug delivery systems, pharmacokinetics, artificial organs, biological transport phenomena, and temperature regulation.

A brief outline or overview of the course content:

**BIOLOGICAL HEAT TRANSFER** (4 weeks)
- thermodynamics and heat transfer mechanisms
- temperature regulation / comfort temperature
- regional heat transfer analysis
- therapeutic hyperthermia and hypothermia

**PHARMACOKINETICS and DRUG DELIVERY** (5 weeks)
- compartmental models
- oral vs intravenous injections
- dosage regimens
- drug delivery systems
- physiological pharmacokinetics
- chronopharmacology

**ARTIFICIAL ORGAN SYSTEMS** (3 weeks)
- artificial kidney -- hemodialysis and peritoneal dialysis
- plasmapheresis
- bioartificial organs (e.g., liver)
- artificial lung -- membrane oxygenators
- artificial heart

**PHYSIOLOGIC TRANSPORT** (3 weeks)
- biological membranes and membrane transport
- oxygen transport in capillaries -- implications for stroke
- nervous system -- impulses and signal transmission

Course Description:

CHE 455 is an elective course that examines the application of chemical engineering principles (thermodynamics, transport, and kinetics) to the analysis of a number of medically related phenomena and devices. Specific topics include drug delivery systems, pharmacokinetics, artificial organs, biological transport phenomena, and temperature regulation. One of the important goals of the course is to understand how chemical engineers go about developing appropriate physical models for complex biological systems. Emphasis will be placed on identifying the key physical / biological phenomena governing the system behavior. Where appropriate, the course will also examine some of the social, political, and economic implications of medical technology in our society, e.g., the artificial kidney program. Students do not need a background in biology or physiology -- the key biological phenomena will be covered at appropriate places throughout the semester.

The name(s) of the faculty member(s) responsible for the development of the course:

Name: ANDREW ZYDNEY (ALZ3)
Instructional, Educational, and Course Objectives:

This section should define what the student is expected to learn and what skills the student will develop.

By the end of CHE 455, students will be able to:

* Evaluate comfort temperature accounting for convective and radiative heat losses
* Calculate drug concentrations as a function of time using compartmental pharmacokinetic models
* Evaluate drug delivery rates from different drug delivery systems (e.g., osmotic pump, matrix system)
* Evaluate performance of membrane-based artificial organs (e.g., hemodialyzer, membrane oxygenator, plasma filter)

Evaluation Methods:

Include a statement that explains how the achievement of the educational objective identified above will be assessed. The procedures for determining students' grades should be specifically identified.

Evaluation will be based on weekly homework assignments, mid-term exams (two), and a final exam. Homework problems will provide students an opportunity to solve problems related to key subject matter covered in class.

Relationship/Linkage of Course to Other Courses:

This statement should relate the course to existing or proposed new courses. It should provide a rationale for the level of instruction, for any prerequisites that may be specified, or for the course's role as a prerequisite for other courses.

CHE 455 builds upon the principles of thermodynamics, heat transfer, mass transfer, and material balances covered in the Chemical Engineering curriculum. CHE 350 (or an equivalent heat transfer course) is a formal prerequisite. Students are encouraged to take CHE 410 concurrently.

Relationship of Course to Major, Option, Minor, or General Education:

This statement should explain how the course will contribute to the major, option, or minor and indicate how it may function as a service course for other departments.

CHE 455 satisfies the requirement for 3 credits of CHE 400-level elective in the Chemical Engineering curriculum.

A description of any special facilities:

None

Frequency of Offering and Enrollment:

Once every 2 to 4 semesters. Expected enrollment of 30-50 students.

Campuses That Have Offered ( ) Over The Past 4 Years

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Review History

This section represents all consultation history that has occurred on this proposal

Legend

Approve
Rejected
Waiting Review
User Action Required
Pending Action(s)
Moved to Rejected Status
Approved
(#) - Review Order Sequence Number

Consultation

Recipient Name: CHENG DONG
Department: Biomedical Engineering
Position: Consultation
Campus: UNIVERSITY PARK CAMPUS
| Title: DEPT HEAD/DIST. PROF BIO |

| (1) Request sent: 9/8/2017 at 2:52 PM |
| Concur: Yes |
| Comments: |
| Reviewed On: 9/8/2017 at 3:20 PM |

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<tr>
<td>Recipient Name: PHILLIP SAVAGE</td>
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<td>Department: (Not Available)</td>
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<td>Position: Head of Department</td>
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| Comments: [Not Yet Reviewed] |
| Reviewed On: [Not Yet Reviewed] |

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<td>Recipient Name: ROBERT MELTON</td>
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| Comments: [Not Yet Reviewed] |
| Reviewed On: [Not Yet Reviewed] |

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<tr>
<td>Recipient Name: PETER BUTLER</td>
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<td>Department: (Not Available)</td>
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<td>Position: Dean of the College</td>
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| Concur: [Not Yet Reviewed] |
| Comments: [Not Yet Reviewed] |
| Reviewed On: [Not Yet Reviewed] |

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<td>Recipient Name: ALLISON ALBINSKI</td>
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<tr>
<td>Department: (Not Available)</td>
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| Comments: [Not Yet Reviewed] |
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Curricular Information

Blue Sheet Item #:
Review Date:

**SCRID Numbers**

(CHE 455):

Reviewed On: [Not Yet Reviewed]
SENATE COMMITTEE ON CURRICULAR AFFAIRS
COURSE SUBMISSION AND CONSULTATION FORM

Principal Faculty Member(s) Proposing Course

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<tr>
<td>IBRAHIM OZBOLAT</td>
<td>ito1</td>
<td>Engineering (EN)</td>
<td>Not Available</td>
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Academic Home: Engineering (EN)
Type of Proposal: ☑ Add ☐ Change ☐ Drop

Course Designation
(ESC 430) Advanced Biofabrication Processes

Course Information
Cross-Listed Courses:
BME 430

Prerequisites:
At least 7th semester classification so that students have a robust technical background before taking the course.

Corequisites:
Concurrents:

Recommended Preparations:
Abbreviated Title: Adv Biofab Process
Discipline: None
Course Listing:

Special categories for Undergraduate (001-499) courses

Foundations
☐ Writing/Speaking (GWS)
☐ Quantification (GQ)

Knowledge Domains
☐ Health & Wellness (GHW)
☐ Natural Sciences (GN)
☐ Arts (GA)
☐ Humanities (GH)
☐ Social and Behavioral Sciences (GS)

Additional Designations
☐ Bachelor of Arts
☐ International Cultures (IL)
☐ United States Cultures (US)
☐ Honors Course
☐ Common course number - x94, x95, x96, x97, x99
☐ Writing Across the Curriculum
First-Year Engagement Program
☐ First-Year Seminar
Course Outline

A brief outline or overview of the course content:
1. Introduction
2. Review of Basic Statistics
   i. Basic of statistics
   ii. Data presentation
   iii. Methods of center and variability measurements
   iv. Regression
3. Statistics for Analysis of Experimental Data
   i. Experimental design
   ii. Hypothesis testing
4. Hypothesis Testing with Two Samples
   i. Large independent samples
   ii. Small independent samples
   iii. Dependent samples
5. Introduction to Biofabrication
   i. Tissue engineering
   ii. Tissue scaffolding
   iii. Biofabrication techniques
6. Traditional Manufacturing Processes for Tissue Engineering
   i. Laser and shoot peening
   ii. Traditional scaffold fabrication techniques
   iii. Limitations
7. Micro-patternning and Molding
   i. Etching
   ii. Laser machining
   iii. Photo lithography
   iv. Soft lithography
8. Microfluidics in Tissue Engineering
   i. Microfluidics
   ii. Manufacturing of microfluidics devices
   iii. Use of microfluidics
   iv. Organ-on-a-chip devices
9. Scaffold-free Tissue Fabrication
   i. Cell sheet technology
   ii. Tissue spheroid fabrication techniques
   iii. Tissue strands and other scaffold-free tissue constructs
10. Modular Assembly
    i. Microfluidic assembly
    ii. Ratchet assembly
    iii. Acoustic assembly
    iv. Magnetic assembly
    v. Surface tension-driven assembly
11. 3D Printing in Tissue Engineering
    i. Selective laser sintering and stereolithography
    ii. 3D printing
    iii. Bioplotting
A listing of the major topics to be covered with an approximate length of time allotted for their discussion:

1. Introduction (1.5 hours)
2. Review of Basic Statistics (3 hours)
3. Statistics for Analysis of Experimental Data (3 hours)
4. Hypothesis Testing with Two Samples (6 hours)
5. Introduction to Biofabrication (6 hours)
6. Traditional Manufacturing Processes for Tissue Engineering (6 hours)
7. Micro-patternning and Molding (3 hours)
8. Microfluidics in Tissue Engineering (4.5 hours)
9. Scaffold-free Tissue Fabrication (4.5 hours)
10. Modular Assembly (3 hours)
11. 3D Printing in Tissue Engineering (4.5 hours)

Course Description:
This course covers advanced biofabrication processes used in tissue engineering, regenerative medicine and drug testing, and provides fundamental statistical concepts and tools that are required to analyze biofabrication process data. Topics include: Introduction, Review of Basic Statistics, Statistics for Analysis of Experimental Data, Hypothesis Testing with Two Sample, Introduction to Biofabrication, Traditional Manufacturing Processes for Tissue Engineering, Micro-patternning and Molding, Microfluidics in Tissue Engineering, Scaffold-free Tissue Fabrication, Modular Assembly and 3D Printing in Tissue Engineering. The course also includes utilization of software packages, hands-on laboratory homework assignments.

The name(s) of the faculty member(s) responsible for the development of the course:
Name: IBRAHIM OZBOLAT (ito1)
Title: ASSOC PROF ENGINEERING
Phone: +1 814 863 5819
Address: W313 MILLENNIUM SCI COMPLEX
Campus: UP
City: UNIVERSITY PARK
Fax:

Course Justification

Instructional, Educational, and Course Objectives:
This section should define what the student is expected to learn and what skills the student will develop.
The instructional objectives include effectively employing the usual vehicles of lectures, but also, effectively utilizing classroom and laboratory demonstrations including the training on the use of statistical software, micromolding of soft materials and microfluidics.

The educational objectives include understanding the engineering basis and principles for biofabrication processes utilizing traditional manufacturing techniques, micromolding, microfluidics, scaffold-free approaches, modular assembly and 3D printing, which can be used in the application domains of tissue engineering and regenerative medicine, and drug testing.

The course objective is to develop and train engineers (a) who are fully cognizant of the engineering basis of various biofabrication techniques, of their current impact and future potential, and of their societal implications, and (b) who have acquired necessary statistical concepts and hands-on practices to setup a biofabrication platform and analyze relevant data.

After successful completion of this course, a student will be able to gain fundamental understanding of biofabrication processes and use such knowledge in tissue fabrication for a broad spectrum of applications.

Evaluation Methods:
Include a statement that explains how the achievement of the educational objective identified above will be assessed.
The procedures for determining students' grades should be specifically identified.
The course evaluation methods will be 3 exams and 3 hands-on homework assignments. The exams will have a weight of 70% (Exam I~20%; Exam II~20%; Final Exam~30%) and the block of 3 homework assignments will have a weight of 30%. Homework assignments are equally weighted.

Relationship/Linkage of Course to Other Courses:
This statement should relate the course to existing or proposed new courses. It should provide a rationale for the level of instruction, for any prerequisites that may be specified, or for the course's role as a prerequisite for other courses.
Advanced Biofabrication Processes is a highly unique course on campus. It briefly covers statistical concepts used in biofabrication processes, where these statistical concepts are covered in details in other courses such as IE 323 and STAT 460. 3D printing in tissue engineering is discussed in one chapter, which is covered in great details in the proposed course E SC 518 Bioprinting.

Relationship of Course to Major, Option, Minor, or General Education:
This statement should explain how the course will contribute to the major, option, or minor and indicate how it may function as a service course for other departments.
This course will be a supporting course for the minor in Nanotechnology offered by the Engineering Science and Mechanics Department. ESC 430 is not a required prerequisite for any other course.

A description of any special facilities:
The bioprinting laboratory in the Millennium Science Complex will be used for micro-molding experiments.

Frequency of Offering and Enrollment:
It is anticipated that this course will be offered every Fall. The enrollment is anticipated to be 15 students/offering.

Campuses That Have Offered ( ) Over The Past 4 Years

| SEMESTER | AB | AL | BK | BR | BW | CR | DS | ER | FE | GA | GV | HB | HN | HY | LV | MA | NK | PC | SH | SL | UP | WB | WC | WS | XC | XP | XS | YK |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|

Review History
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Legend
- Approve
- Rejected
- Waiting Review
- User Action Required
- Pending Action(s)
- Moved to Rejected Status
- Approved
- (#) - Review Order Sequence Number

Consultation

Recipient Name: BRUCE GLUCKMAN  Department: (Not Available)
Position: Consultation  Campus: (Not Available)
Title: ASSOC PROF ESM & NEUROSUR

Request sent: 6/12/2017 at 4:06 PM
Last sent: 6/26/2017 at 7:30 AM
Concur: Yes
Comments: (Completed By Default - Exceeded Time Limit)
Reviewed On: 6/27/2017 at 7:15 AM

Recipient Name: CHENG DONG  Department: Biomedical Engineering
Position: Consultation  Campus: UNIVERSITY PARK CAMPUS
Title: DEPT HEAD/DIST. PROF BIO

Request sent: 6/12/2017 at 4:06 PM
Last sent: 6/19/2017 at 7:30 AM
Concur: Yes
Comments:
Reviewed On: 6/20/2017 at 1:06 PM

Recipient Name: HUANYU CHENG  Department: Engineering Science And Mechanics
Position: Consultation  Campus: UNIVERSITY PARK CAMPUS
Title: ASST PROF ASST PROFESSOR
Request sent: 6/12/2017 at 4:06 PM
Concur: Yes
Comments:
Reviewed On: 6/13/2017 at 10:38 AM

Recipient Name: JANIS TERPENNY
Department: Industrial And Manufacturing Engineering
Position: Consultation
Campus: UNIVERSITY PARK CAMPUS
Title: DEPT HEAD & PROF INDUSTL

Request sent: 6/12/2017 at 4:06 PM
Last sent: 6/26/2017 at 7:30 AM
Concur: Yes
Comments: (Completed By Default - Exceeded Time Limit)
Reviewed On: 6/27/2017 at 7:15 AM

Recipient Name: JIAN YANG
Department: Biomedical Engineering
Position: Consultation
Campus: UNIVERSITY PARK CAMPUS
Title: PROFESSOR BIOENGINEERING

Request sent: 6/12/2017 at 4:06 PM
Concur: Yes
Comments: Bioprinting is current a hot topic in the field of regenerative engineering. I think it is a good timing to have such a course at PSU.
Reviewed On: 6/12/2017 at 4:43 PM

Recipient Name: JUSTIN BROWN
Department: Biomedical Engineering
Position: Consultation
Campus: UNIVERSITY PARK CAMPUS
Title: ASSOC PROF OF BIOMEDICAL

Request sent: 6/12/2017 at 4:06 PM
Last sent: 6/19/2017 at 7:30 AM
Concur: Yes
Comments: Minor overlap with BME 445 and possibly some of the biomaterials courses already offered, but not to a problematic extent.
Reviewed On: 6/19/2017 at 10:37 AM

Recipient Name: KAREN THOLE
Department: Mechanical Engineering
Position: Consultation
Campus: UNIVERSITY PARK CAMPUS
Title: DEPT HEAD MNE

Request sent: 6/12/2017 at 4:06 PM
Concur: Yes
Comments:
Reviewed On: 6/12/2017 at 7:57 PM
Recipient Name: KULTEGIN AYDIN  
Department: Electrical Engineering  
Position: Consultation  
Campus: UNIVERSITY PARK CAMPUS  
Title: DEPT HEAD/PROF ELECT ENGR  
Request sent: 6/12/2017 at 4:06 PM  
Concur: Yes  
Comments:  
Reviewed On: 6/18/2017 at 11:08 AM

Recipient Name: LUCAS PASSMORE  
Department: Engineering Science And Mechanics  
Position: Consultation  
Campus: UNIVERSITY PARK CAMPUS  
Title: Assistant Professor  
Request sent: 6/12/2017 at 4:06 PM  
Last sent: 6/26/2017 at 7:30 AM  
Concur: Yes  
Comments: (Completed By Default - Exceeded Time Limit)  
Reviewed On: 6/27/2017 at 7:15 AM

Recipient Name: M PARFITT  
Department: Architectural Engineering  
Position: Consultation  
Campus: UNIVERSITY PARK CAMPUS  
Title: PROFESSOR ARCH ENGR  
Request sent: 6/12/2017 at 4:06 PM  
Last sent: 6/19/2017 at 7:30 AM  
Concur: Yes  
Comments:  
Reviewed On: 6/19/2017 at 12:32 PM

Recipient Name: MELIK DEMIREL  
Department: Engineering Science And Mechanics  
Position: Consultation  
Campus: UNIVERSITY PARK CAMPUS  
Title: PROFESSOR ENGR SCI & MECH  
Request sent: 6/12/2017 at 4:06 PM  
Last sent: 6/19/2017 at 7:30 AM  
Concur: Yes  
Comments:  
Reviewed On: 6/19/2017 at 10:56 AM

Recipient Name: MICHAEL LANAGAN  
Department: Engineering Science And Mechanics  
Position: Consultation  
Campus: UNIVERSITY PARK CAMPUS  
Title: PROF ESM/MSE
Request sent: 6/12/2017 at 4:06 PM
Concur: Yes
Comments: A significant portion of the course is devoted to statistical analysis, which may conflict with ESC 433H. Please have a discussion with the ESC 433H instructors to review and compare notes on statistics before delivering the course for the first time.
Reviewed On: 6/15/2017 at 10:41 AM
Initiator Comments: Thanks for your comment. The course does not discuss probability and very basic statistics, but rather focuses on hypothesis testing, which is important in research in biofabrication.

Request sent: 6/28/2017 at 8:27 AM
Concur: Yes
Comments:
Reviewed On: 6/28/2017 at 9:35 AM

Recipient Name: PATRICK FOX  
Department: Civil And Environmental Engineering  
Position: Consultation  
Campus: UNIVERSITY PARK CAMPUS  
Title: PROF AND DEPT HEAD

Request sent: 6/12/2017 at 4:06 PM
Concur: Yes
Comments:
Reviewed On: 6/12/2017 at 10:06 PM

Recipient Name: PAUL HEINEMANN  
Department: Agricultural And Biological Engineering  
Position: Consultation  
Campus: UNIVERSITY PARK CAMPUS  
Title: DEPT HD/PROF AG & BIO ENG

Request sent: 6/12/2017 at 4:06 PM
Concur: Yes
Comments: Proposal looks okay. College committee may question 400 level course without prerequisites.
Reviewed On: 6/13/2017 at 9:55 AM
Initiator Comments: Thank you for your comments. A 7th semester standing was added as a prerequisite.

Request sent: 6/27/2017 at 4:31 PM  
Last sent: 7/10/2017 at 7:30 AM
Concur: Yes
Comments:
Reviewed On: 7/10/2017 at 7:53 AM

Recipient Name: PHILIP MORRIS  
Department: Aerospace Engineering  
Position: Consultation  
Campus: UNIVERSITY PARK CAMPUS  
Title: BOEING PROFESSOR OF AERSP

Request sent: 6/12/2017 at 4:06 PM  
Last sent: 6/26/2017 at 7:30 AM
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Position: Consultation  
Title: Professor and Department Head

Request sent: 6/12/2017 at 4:06 PM
Concur: Yes
Comments:
Reviewed On: 6/17/2017 at 12:58 PM

Recipient Name: THOMAS LAPORTA
Department: Computer Science And Engineering
Position: Consultation
Title: LNHRDCHAIRPROF & DIR EECS

Recipient Name: WILLIAM HANCOCK
Department: Bioengineering
Position: Consultation
Title: PROFESSOR BIOENGINEERING

Recipient Name: YONG WANG
Department: Biomedical Engineering
Position: Consultation
Title: PROFESSOR BIOMEDICAL

Recipient Name: JUDITH TODD
Department: (Not Available)
Position: Head of Department
Title:

Concur: [Not Yet Reviewed]
Comments: [Not Yet Reviewed]
Reviewed On: [Not Yet Reviewed]
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**Curricular Information**

Blue Sheet Item #: [ ]

Review Date: 

**SCRID Numbers**

(ESC 430): [ ]
SENATE COMMITTEE ON CURRICULAR AFFAIRS
COURSE SUBMISSION AND CONSULTATION FORM

Principal Faculty Member(s) Proposing Course

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<th>Name</th>
<th>User ID</th>
<th>College</th>
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<tr>
<td>ANDREW ERDMAN</td>
<td>ame17</td>
<td>Engineering (EN)</td>
<td>Not Available</td>
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</table>

Academic Home: Engineering (EN)

Type of Proposal: [X] Add  [ ] Change  [ ] Drop

Course Designation

(ESC 460W) Multidisciplinary Design Project

Course Information

Cross-Listed Courses:

Prerequisites:

Senior standing in the students major or junior standing in Engineering Science Honors Curriculum or Schreyer Honors College. CHEM 110 MATH 140 MATH 141 MATH 250; OR MATH 251 PHYS 211; OR PHYS 212

Corequisites:

Concurrents:

Recommended Preparations:

Abbreviated Title: Multidisc Design

Discipline: None

Course Listing:

Special categories for Undergraduate (001-499) courses

Foundations

[ ] Writing/Speaking (GWS)
[ ] Quantification (GQ)

Knowledge Domains

[ ] Health & Wellness (GHW)
[ ] Natural Sciences (GN)
[ ] Arts (GA)
[ ] Humanities (GH)
[ ] Social and Behavioral Sciences (GS)

Additional Designations

[ ] Bachelor of Arts
[ ] International Cultures (IL)
[ ] United States Cultures (US)
[ ] Honors Course
[ ] Common course number - x94, x95, x96, x97, x99
[ ] Writing Across the Curriculum
[ ] First-Year Engagement Program
[ ] First-Year Seminar
Course Outline

A brief outline or overview of the course content:
The course focuses on multidisciplinary design projects offered in conjunction with the College of Engineering’s Learning Factory. Design teams of three to five engineering students from two or more engineering majors work on industry-sponsored, government-sponsored, or service-based design projects. Across the semester the design team works with the project sponsor to conceptualize, design, build, and demonstrate a solution to the problem posed. This course focuses on multidisciplinary, innovative design projects for a variety of partners which may change semester to semester. Teams will apply fundamental design and analysis methods to open-ended engineering problems. Lectures and course material will also be provided by the instructor on project management, design, product manufacturing, intellectual property, engineering ethics, societal/global/contemporary/professional issues, and related topics, in addition to specific invited technical lectures relating to student projects.

A listing of the major topics to be covered with an approximate length of time allotted for their discussion:
The following topics will be covered during 75-min lectures:
• Brainstorming techniques 1.25 hours
• Project management 1.25 hours
• Root Cause Analysis and Decision Analysis 1.75 hours
• Working on multidisciplinary teams and team motivation 1.25 hours
• Intellectual property, patents, and copyrights 1.25 hours
• Product design and development 1.25 hours
• Professional Etiquette 1.25 hours
• Manufacturing and fabrication techniques 1.25 hours
• Codes and standards 1.25 hours
• Engineering ethics 1.25 hours
• Societal/contemporary/professional issues 1.75 hours
• Working in a global economy 1.25 hours
• Career paths and advancement opportunities 1.25 hours

The following topics will be covered during weekly progress reviews:
• Progress review presentations to mock executives 3.75 hours

The following topics will be covered during mid- and end-semester project reviews:
• Project presentations of Statement of Work and Final Reports to entire class 4.00 hours

The following will be covered in weekly meetings of student teams:
• Team organization, project plans and progress, work assignments, budget and issue resolution 20 hours.

Time will also be allocated for facility safety tours and training, team presentations (proposal/statement of work and final report), contacting the sponsor and making weekly progress reports, conducting a site visit(s), developing design concepts, prototyping, manufacturing/fabrication, and testing.

Course Description:
This course will provide students with the opportunity to learn the design process in the context of an industry- or government-sponsored or service-based design project that demands delivering a working solution. The design projects in this course will be structured for students from two or more different engineering majors, as defined by the project sponsors in collaboration with the instructor and departmental project coordinators. While the projects may be supplied/supported/initiated by industry, topics may be related to the cutting-edge multidisciplinary research areas represented by the strengths and diversity of the Engineering Science...
The name(s) of the faculty member(s) responsible for the development of the course:

Name: ANDREW ERDMAN (ame17)
Title: WALTER ROBB DIRECTOR ELDM
Phone: +1 814 863 9074
Address: 213E HAMMOND BLDG
Campus: UP
City: UNIVERSITY PARK
Fax: 

Course Justification

Instructional, Educational, and Course Objectives:
This section should define what the student is expected to learn and what skills the student will develop.

This course will provide students with the opportunity to learn the design process in the context of an industry- or government-sponsored or service-based design project that demands delivering a working solution. The design projects in this course will be structured for students from two or more different engineering majors, as defined by the project sponsors in collaboration with the instructor and departmental project coordinators. While the projects may be supplied/supported/initiated by industry, topics may be related to the cutting-edge multidisciplinary research areas represented by the strengths and diversity of the Engineering Science faculty, such as nanotechnology, biomaterials, and other areas requiring cross-discipline collaboration. The project sponsor will provide the technical expertise for the project, a clear definition of all project deliverables, and the financial support to cover needed materials and supplies and travel costs. Project sponsors will be invited to attend two key events each semester: Project Kickoff in week 1 of the semester to define the project and answer questions from the students as well as the Design Showcase in week 15 of the semester, when teams present their project results to sponsors, faculty, other students, and the public. The College of Engineering will provide the facilities where the design teams will work together to develop the design concept and prototype solutions. Faculty members in the Department of Engineering Science and Mechanics will administer the course, including reading, evaluating, and grading the final project report, provide lectures on topics including on project management, design, product manufacturing, intellectual property, engineering ethics, societal/global/contemporary/professional issues, and related technical topics, and organize invited technical lectures related to industry projects. In accordance with standard procedures, specific multidisciplinary projects will be selected for this course to provide challenging design experiences for all students. The selection of these projects will be done by the course instructor prior to the start of each semester of the course offering. Multidisciplinary teams are be formed based on specific technical elements of the project and project scope.

Evaluation Methods:
Include a statement that explains how the achievement of the educational objective identified above will be assessed.

The procedures for determining students’ grades should be specifically identified.

Student knowledge and understanding will be assessed by the instructor who will read and evaluate the weekly progress reports, final report, project presentations, the design process, and the final prototype. Each student will also be evaluated by the company representative who will work closely with the design group. The final grade will be based on:

- Participation & Attendance: 5%
- Weekly Progress Reports: 15%
- Project Proposal/Statement of Work: 20%
- Detailed Design Report: 10%
- Final Report/Presentation/Deliverables: 20%
- Poster: 5%
- Overall Quality: 10%
- Professionalism, Self, Peer and Sponsor Evaluations: 10%
- Weekly Presentations: 5%

The course instructor will assign overall grades and provide departments with appropriate grade distributions for specific ABET outcomes as requested. Specific departmental needs (e.g., check lists) will be communicated to the instructor prior to the start of the semester to ensure timely completion.

Relationship/Linkage of Course to Other Courses:
This statement should relate the course to existing or proposed new courses. It should provide a rationale for the level of instruction, for any prerequisites that may be specified, or for the course’s role as a prerequisite for other courses.

This course links with other department senior capstone design courses, such as ME 440, while allowing students from various majors to work on multidisciplinary teams, much as would be prevalent in industry. The prerequisites for this course are senior
standing in the student’s major or junior standing in Engineering Science Honors Curriculum or Schreyer Honors College. In accepting junior standing honors students, accommodation is made to allow for their more aggressive curriculum, while allowing them to pursue a capstone design experience, teamed with seniors from other departments, as well as a year-long senior honors thesis. Prerequisite courses for the honors students include the following ETM requirements: CHEM 110, MATH 140, MATH 141, MATH 250 or 251, PHYS 211 or PHYS 212. This course is not a prerequisite for any other course.

Relationship of Course to Major, Option, Minor, or General Education:
This statement should explain how the course will contribute to the major, option, or minor and indicate how it may function as a service course for other departments.
ESC 460W is intended to provide a multidisciplinary capstone design experience for Engineering Science and Mechanics students in industry-sponsored, government-sponsored and service-based design projects that need expertise from two or more engineering disciplines. This experience is formulated to provide realistic experiences similar to those that may be encountered in an industrial or government full-time position. The course is offered as a foundational and/or technical elective for the Engineering Science major. This course may also be taken as an engineering capstone or senior design elective for students in other majors.

A description of any special facilities:
Access to and utilization of two design-support facilities in the College of Engineering, namely the Center for Engineering Design and Entrepreneurship (CEDE) and the Bernard M. Gordon Learning Factory, are utilized for ESC 460W. These two facilities are already used for senior capstone design projects in other departments.

Frequency of Offering and Enrollment:
The Multidisciplinary Capstone Design Project course has been successfully offered every fall and spring semester since spring 2011 as E SC 497. The course will be offered every fall and spring semester with enrollments estimated to be 20 to 25 students per semester.

Writing Across the Curriculum (W,M,X,Y course suffixes)
A copy of the course syllabus:
List of files uploaded follow. These files can be viewed by viewing the print preview as a PDF (button at the top of the print preview page) or navigating to the request consultation page for this proposal.

A concise explanation of how the proposed course will fulfill each of the following criteria:
Both informal and formal writing assignments should relate clearly to the course objectives and should serve as effective instruments for learning the subject matter of the course. Instructors should communicate to students the requirements of formal, graded writing assignments in writing, not just orally. In writing-intensive courses, writing assignments are characterized to help students investigate the course subject matter, gain experience in interpreting data or the results of research, shape writing to a particular audience, or practice the type of writing associated with a given profession or discipline. Much of the writing may be informal and ungraded, yet meaningful, so students are encouraged to think and discover through a process in which mistakes are a natural part of learning. Examples of such writing include one-minute papers at the beginning, middle, or end of class; reactions to lectures, labs, and readings; journals, logs, and notebooks of observations, readings, and other experimental activities; letters to classmates; weekly digests; e-mail dialogues; records of peer group discussions; and stories of one’s thinking on a problem.

Multidisciplinary Design Project work progresses over the semester, with at least three formal written reports, weekly status reports, and final poster and project summary. All written reports are graded by the faculty member and also delivered to the project sponsor. In all cases, an outline or template and grading guidance is provided for each report type and weekly status report. The project report document progresses against milestones, define how design specifications are met, and map prototype design features against performance metrics. The project report typically build upon themselves in sequence with the final report a compilation of updated previous reports. Both project reports and weekly reports are team-based assignments. To ensure all team members are actively participating in the writing and editing, students are held responsible for sections of reports or being the final editor and the responsibility for submitting the weekly report is a rotating task across all team members. Anonymous peer assessments provide assurance that all have participated.

Students will be afforded opportunities to practice writing throughout the semester, with emphasis given to writing as a process that develops through several iterations. Typically, writing-intensive courses require multiple writing assignments, a sequence of preparatory writings (outline, formulation of thesis, first draft) leading to a final product, or informational writing assignments (e.g., regular journal entries, field notes, short in-class papers, revision of first draft) that aid students in developing other written documents. Experimentation with assignments is encouraged.

Writing in multidisciplinary design courses is a developmental process, with the opportunity for student teams to re-submit reports after a first grading cycle, showing edits and clarifications from the faculty or sponsor have been incorporated into the subsequent version of the report. The goal in the “write-edit-rewrite” process is to move students from novice to expert technical writers, and to deliver a top-quality final report that summarizes results of the semester-long design project.

Opportunities for students to receive written feedback from the instructor and to apply the instructor’s feedback to their future writing will be built into the course. The instructor will clearly identify and explain the type of writing required in the course and provide guidance as needed. A writing-intensive course may also include peer review of written work, tutorial assistance, instructor conferences, Group writing projects, the use of writing or learning centers, teaching assistant feedback, and classroom discussions of assigned readings about writing. The use of diverse feedback
mechanisms is encouraged, but none of these mechanisms should substitute for the instructor as the principal source of written feedback to the student.

feedback on writing is provided in one of three ways. one option is for hand-written edits, comments and suggestions to be made to hard copies of the report, which is returned to the team. this option can provide clear guidance for severe organizational or clarity problems in the report, or when it is important for students to compare original text to edited text. the second option is to track changes and added comments to the edited version of the report using word processing software and returned via the course management system (e.g. canvas). a third option is to provide specific written feedback as comments on the grade management portion of the course management system, where pages, paragraphs, and or sentences are pointed out that require modification.

writing will be evaluated by the instructor, and writing quality will be a factor in determining each student’s final grade. before students begin writing, instructors will communicate to students the criteria by which their writing will be evaluated. sound criteria for assessing writing quality include, but are not limited to, the writer’s ability to direct the material to an intended audience, the employment of organizational strategies, the development of both content and reasoning, adherence to conventions of a particular discipline, accuracy of the information presented, citation and integration of sources, grammar, diction and syntax, and spelling. writing assignments should be worth at least 25 percent of each student’s final grade.

templates are provided for all major written reports, and weekly status reports, with discussions on how these formats are used in industry, and how clear, concise writing is a critical skill for successful engineers. the written reports are graded based on the following factors: followed the template (or had a reasonable alternative), basic writing quality (no errors in grammar, spelling, verb tense, run-on sentences), paragraph structure, transitions between topics, references to and discussion of the information in figures and tables, accuracy of information, and proper citations and use of references. writing assignments make up at least 45% of each student’s final grade.

Campuses that have offered (%) over the past 4 years

| semester | AB | AL | BK | BR | BW | CR | DS | ER | FE | GA | GV | HB | HN | HY | LV | MA | NK | PC | SH | SL | UP | WB | WC | WS | XC | XP | XS | YK |
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Review history

This section represents all consultation history that has occurred on this proposal

Legend

✔ Approve

✘ Rejected

❓ Waiting Review

🔍 User Action Required

⚠ Pending Action(s)

 направлен to Rejected Status

✔ Approved

(#) - Review Order Sequence Number

Consultation

✔ Recipient name: Alan Verbanec

Department: Computer Science and Engineering

Position: Consultation

Campus: University Park Campus

Title: Instructor of CSE

(24) Request sent: 5/26/2017 at 10:55 AM

Last sent: 6/5/2017 at 7:30 AM

Concur: Yes

Comments: (Completed By Default - Exceeded Time Limit)

Reviewed On: 6/10/2017 at 7:15 AM

(25) Request sent: 5/26/2017 at 10:55 AM

Last sent: 6/5/2017 at 7:30 AM

Concur: Yes

Comments: (Completed By Default - Exceeded Time Limit)

Reviewed On: 6/10/2017 at 7:15 AM
Recipient Name: ARTHUR MOTTA  
Department: Nuclear Engineering  
Position: Consultation  
Campus: UNIVERSITY PARK CAMPUS  
Title: PROF & CHAIR OF NUCL ENGR

Request sent: 5/26/2017 at 10:55 AM  
Last sent: 6/5/2017 at 7:30 AM  
Concur: Yes  
Reviewed On: 6/5/2017 at 8:42 AM

Recipient Name: BARBARA SHAW  
Department: (Not Available)  
Position: Consultation  
Campus: (Not Available)  
Title: PROF ENGR SCI & MECH

Request sent: 5/26/2017 at 10:55 AM  
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Concur: Yes  
Comments: (Completed By Default - Exceeded Time Limit)  
Reviewed On: 6/10/2017 at 7:15 AM

Recipient Name: DANIEL HAYES  
Department: Biomedical Engineering  
Position: Consultation  
Campus: UNIVERSITY PARK CAMPUS  
Title: ASSOC PROF ASSOC PROF

Request sent: 5/26/2017 at 10:55 AM  
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Title: DEPT HEAD & PROF INDUSTL

Recipient Name: JANIS TERPENNY  
Department: Industrial And Manufacturing Engineering  
Position: Consultation  
Campus: UNIVERSITY PARK CAMPUS

(34)
Request sent: 5/26/2017 at 10:55 AM  
Last sent: 6/5/2017 at 7:30 AM  
Concur: Yes  
Comments: (Completed By Default - Exceeded Time Limit)  
Reviewed On: 6/10/2017 at 7:15 AM

Title: DEPT HEAD MNE

Recipient Name: KAREN THOLE  
Department: Mechanical Engineering  
Position: Consultation  
Campus: UNIVERSITY PARK CAMPUS  
Title: DEPT HEAD MNE

(35)
Request sent: 5/26/2017 at 10:55 AM  
Last sent: 6/5/2017 at 7:30 AM  
Concur: Yes  
Comments: (Completed By Default - Exceeded Time Limit)  
Reviewed On: 6/10/2017 at 7:15 AM

(21)
Request sent: 5/26/2017 at 10:55 AM  
Last sent: 6/5/2017 at 7:30 AM  
Concur: No, this proposal needs significant changes  
Comments: MNE has one concern regarding this proposed ESC 460W course, which is meant to be a multi-disciplinary capstone course. The only pre-requisites for the ESC 460W course are: Senior standing in the students major or junior standing in Engineering Science Honors Curriculum or Schreyer Honors College. CHEM 110 MATH 140 MATH 141 MATH 250; OR MATH 251 PHYS 211; OR PHYS 212  
Since capstone courses are generally meant to provide a practical implementation of students’ knowledge, it seems odd that there are no ESC course pre-requisites. Perhaps this concern could be addressed prior to approval.  
Reviewed On: 6/5/2017 at 2:26 PM

Initiator Comments: It is desirable to encourage honors students of 6th semester standing or higher to assure that students have taken a sufficient course load to be prepared for the project. In the case of Engineering Science, students would likely have completed E Mch 212H, ME 302, E Sc 414M, 407 H, 312, 433H, and EE 210H, providing a good background in dynamics, thermo/heat transfer, materials, computer methods, circuits, and lab experience. However, as we aim to attract students from across the College of Engineering, including ESC specific prerequisites would hamper their ability to enroll or to transfer into this course. Many honors students have a high number of advanced placement credits, such that we anticipate exceptions on a case by case basis including 5th semester standing students who are qualified to complete the project. Competing with “well prepared” students is the normal challenge for honors students. Based on experience to date, the juniors from the honors program have had no problem keeping up with the others on the team or in the course, and in fact, have embraced the challenge.  
Reviewed On: 6/8/2017 at 9:19 AM

Concur: Yes  
Comments: (Approved: Manual Status Change)  
Reviewed On: 6/12/2017 at 4:24 PM
Title: DEPT HEAD/PROF ELECT ENGR

Recipient Name: KULTEGIN AYDIN
Department: Electrical Engineering
Position: Consultation
Campus: UNIVERSITY PARK CAMPUS
Title: DEPT HEAD/PROF ELECT ENGR

Request sent: 5/26/2017 at 10:55 AM
Concur: Yes
Comments:
Reviewed On: 6/1/2017 at 5:08 PM

Title: INSTR COMP SCI & ENG

Recipient Name: LENNART BILEN
Department: Computer Science And Engineering
Position: Consultation
Campus: UNIVERSITY PARK CAMPUS
Title: INSTR COMP SCI & ENG

Request sent: 5/26/2017 at 10:55 AM
Concur: Yes
Comments:
Reviewed On: 5/26/2017 at 3:32 PM

Title: Assistant Professor

Recipient Name: LUCAS PASSMORE
Department: Engineering Science And Mechanics
Position: Consultation
Campus: UNIVERSITY PARK CAMPUS
Title: Assistant Professor

Request sent: 5/26/2017 at 10:55 AM
Concur: Yes
Comments: I continue to support this course proposal. The students who take it all view it very favorably, and it is a good opportunity for students to integrate an honors level interdisciplinary design project.
Reviewed On: 5/26/2017 at 3:29 PM

Title: PROFESSOR ARCH ENGR

Recipient Name: M PARFITT
Department: Architectural Engineering
Position: Consultation
Campus: UNIVERSITY PARK CAMPUS
Title: PROFESSOR ARCH ENGR

Request sent: 5/26/2017 at 10:55 AM
Concur: Yes
Comments: I continue to support this course proposal. The students who take it all view it very favorably, and it is a good opportunity for students to integrate an honors level interdisciplinary design project.
Reviewed On: 5/26/2017 at 3:29 PM
Recipient Name: **MICHAEL IMMEL**  
**Department:** (Not Available)  
**Position:** Consultation  
**Campus:** (Not Available)  
**Title:** INSTRUCTOR OF IE

Recipient Name: **PATRICK FOX**  
**Department:** Civil And Environmental Engineering  
**Position:** Consultation  
**Campus:** UNIVERSITY PARK CAMPUS  
**Title:** PROF AND DEPT HEAD

Recipient Name: **PAUL HEINEMANN**  
**Department:** Agricultural And Biological Engineering  
**Position:** Consultation  
**Campus:** UNIVERSITY PARK CAMPUS  
**Title:** DEPT HD/PROF AG & BIO ENG
Request sent: 5/26/2017 at 10:55 AM
Concur: Yes
Comments: Reviewed On: 5/26/2017 at 11:59 AM

Request sent: 5/26/2017 at 10:55 AM
Concur: Yes
Comments: Reviewed On: 5/26/2017 at 11:59 AM

Recipient Name: PHILIP MORRIS  Department: Aerospace Engineering
Position: Consultation  Campus: UNIVERSITY PARK CAMPUS
Title: BOEING PROFESSOR OF AERESP

Request sent: 5/26/2017 at 10:55 AM
Last sent: 6/5/2017 at 7:30 AM
Concur: Yes
Comments: (Completed By Default - Exceeded Time Limit)
Reviewed On: 6/10/2017 at 7:15 AM

Recipient Name: PHILLIP SAVAGE  Department: Chemical Engineering
Position: Consultation  Campus: UNIVERSITY PARK CAMPUS
Title: PROF/DEPT HEAD CHEM ENGR

Request sent: 5/26/2017 at 10:55 AM
Last sent: 6/5/2017 at 7:30 AM
Concur: Yes
Comments: (Completed By Default - Exceeded Time Limit)
Reviewed On: 6/10/2017 at 7:15 AM

Recipient Name: ROBERT KIMEL  Department: Energy And Mineral Engineering
Position: Consultation  Campus: UNIVERSITY PARK CAMPUS
Title: HEAD OF EME & TRIMBLE CHA

Request sent: 5/26/2017 at 10:55 AM
Recipient Name: SVEN BILEN  
Department: School of Engr Design, Technology and Prof Prgrms  
Position: Consultation  
Title: DEPT HEAD/SEDTAPP

Recipient Name: THOMAS LAPORTA  
Department: Computer Science And Engineering  
Position: Consultation  
Title: LNHRDCHAIRPROF & DIR EECS

Recipient Name: TIMOTHY WHEELER  
Department: (Not Available)  
Position: Consultation  
Title: ASST PROF ELECT ENGR
Dean of the College

Recipient Name: PETER BUTLER  Department: (Not Available)
Position: Dean of the College  Campus: UNIVERSITY PARK CAMPUS

Title:


SCCA Subcommittee Review

Recipient Name: ALLISON ALBINSKI  Department: (Not Available)
Position: SCCA Subcommittee Review  Campus: UNIVERSITY PARK CAMPUS

Title:


Recipient Name: KADI CORTER  Department: (Not Available)
Position: SCCA Subcommittee Review  Campus: UNIVERSITY PARK CAMPUS

Title:


Faculty Senate Review

Recipient Name: **ALLISON ALBINSKI**
Department: (Not Available)
Position: SCCA Review
Campus: UNIVERSITY PARK CAMPUS
Title:

Concur: Yes
Comments: (Approved: Manual Status Change)
Reviewed On: 6/12/2017 at 4:24 PM

Concur: [Not Yet Reviewed]
Comments: [Not Yet Reviewed]
Reviewed On: [Not Yet Reviewed]

Recipient Name: **KADI CORTER**
Department: (Not Available)
Position: SCCA Review
Campus: UNIVERSITY PARK CAMPUS
Title:

Concur: Yes
Comments: (Approved: Manual Status Change)
Reviewed On: 6/12/2017 at 4:24 PM

Concur: [Not Yet Reviewed]
Comments: [Not Yet Reviewed]
Reviewed On: [Not Yet Reviewed]

Faculty Senate Review

Recipient Name: **ALLISON ALBINSKI**
Department: (Not Available)
Position: Faculty Senate Review
Campus: UNIVERSITY PARK CAMPUS
Title:

Concur: Yes
Comments: (Approved: Manual Status Change)
Reviewed On: 6/12/2017 at 4:24 PM

Concur: [Not Yet Reviewed]
Comments: [Not Yet Reviewed]
Reviewed On: [Not Yet Reviewed]

Recipient Name: **KADI CORTER**
Department: (Not Available)
Position: Faculty Senate Review
Campus: UNIVERSITY PARK CAMPUS
Title:

Concur: Yes
Comments: (Approved: Manual Status Change)
Reviewed On: 6/12/2017 at 4:24 PM

Concur: [Not Yet Reviewed]
Comments: [Not Yet Reviewed]
Reviewed On: [Not Yet Reviewed]
Curricular ReportID: (Not Specified)
Curricular Report Date: (Not Specified)
Curricular Approval Date: (Not Specified)
Actual Effective Date: (Not Specified)

Curricular Information
Blue Sheet Item #:
Review Date:

SCRID Numbers
(ESC 460W):

UPLOADED DOCUMENTS:
Context Type: Syllabus
File Description: Writing Requirements Syllabus
File Name: 460W Syllabus.pdf
UPLOADED DOCUMENTS FOLLOW:
Copy of the Course Syllabus

Penn State University
Department of Engineering Science and Mechanics
ESC 460W Multidisciplinary Design Project
Section 1 – Fall 2017
Syllabus revision number: 0

Supervisor: Mike Erdman Teaching Assistant: TBD
213E Hammond Building
Telephone: 863-9074
Email: ame17@psu.edu
Office hours: Monday and Friday 1:00-2:00 PM
or by appointment

Location: Tuesday 11:15A – 2:15P 113 IST Building
Thursday 1:00P – 2:15P 113 IST Building

Web site for general project resources and information: http://www.lf.psu.edu/

Course Objectives: The objective of the course is to provide the student with “real-world” industry project experience. You will learn team skills, develop your ability to communicate technical program plans, status and results (oral and written), develop project planning and management skills, and solve a real problem of importance to your sponsor.

Course Description:
Students develop skills and techniques for managing and executing engineering design projects. These skills are applied to an industry-sponsored project. Project teams perform all facets of product and process design. This includes problem identification, planning of the project, formulation of design specifications, development and evaluation of alternative conceptual designs, development of detailed designs, specification of manufacturing processes, prototyping of manufacturing processes and parts, and analysis and documentation of results. Students may travel to industrial sites to gain an understanding of existing processes and problems and to assess the customer’s needs. This is a writing intensive course, with weekly concise, yet comprehensive status reports, three major submittals during the semester (the proposal, a design specification, and a final report), and a poster and overview document summarizing the project upon completion. Feedback on communications in a business environment will be given both for written and oral communications.

Pre-requisites: Senior (or honors Junior) class standing

Reference Material (posted on CANVAS and the Leaning Factory web site)

Optional Text: “Product Design and Development”, 4th Ed., by Karl T. Ulrich & Steven D. Eppinger. It is recommended that you purchase the textbook for use in this course and as a reference on future design projects.
Professional Conduct: You are expected to conduct yourself with the utmost personal and professional integrity during all project activities and business. Your overall performance in the class will be evaluated and your professional conduct is an important component of that evaluation. You must strive to complete all your work with responsibility and honesty. As a student in this design course, you are representing yourself as a professional in the field of engineering and you are also representing the Department of Engineering Science and Mechanics, the College of Engineering, and the Pennsylvania State University.

Grading:
Participation & Attendance (note course policy on attendance, below): 5%
Weekly Progress Reports: 15%
Project Proposal/Statement of Work: 20%
Detailed Design Report: 10%
Final Report/Presentation/Deliverables: 20%
Poster: 5%
Overall Quality: 10%
Professionalism, Self, Peer and Sponsor Evaluations: 10%
Weekly Presentations: 5%

Course Policies:
• **Academic Integrity:** Students are expected to abide by the College of Engineering’s Academic Integrity policy, http://www.engr.psu.edu/CurrentStudents/acadinteg.aspx. In this course, students are expected to work together with their team on most assignments including progress reports, written reports, and oral presentations. There are some assignments which are to be done individually, i.e., each student is required to submit his or her own original work. If you have any questions as to which assignments are to be done individually, please ask. Regardless of the nature of the assignment, plagiarism is strictly prohibited. An example of behavior that is considered plagiarism is submitting a written assignment that includes text taken directly from another source and/or text that is not properly referenced. If you have any questions as to how to properly reference material taken from another source, please ask.
• **Deadlines:** All reports and materials are due at the start of the class period as shown in the schedule below or as otherwise specified. Late submissions will NOT be accepted.
• **Grading Disputes:** If a student feels that a report or homework set was graded unfairly or in error, please bring it to my attention in writing within one week after the graded material was handed back. Scores will not be reconsidered after this time period has elapsed.
• **Attendance:** Attendance is expected at the start of and for the duration of each class, or as may be scheduled to accommodate team reports. As a professional courtesy, please inform the instructor or TA prior to any anticipated legitimate absences. Two absences without a reasonable excuse is one letter grade reduction, and so on. Job interview absences must be previously cleared with all team members and the instructor. Also see the Faculty Senate Policy on Class Attendance (42-27), http://www.senate.psu.edu/policies/42-00.html#42-27.
• **Cell Phones and computers:** Turn cell phones off upon entering classroom. Internet access devices or other computers are not to be used during class for any non-class related activities.

Additional Course Requirements and Information:
Project Notebook: One team member is responsible for organizing and maintaining a project notebook throughout the semester. This can be an electronic journal (easily accessible to the project members and instructor) or a permanently bound working journal (a.k.a. design logbook, record book, notebook). The notebook should include drawings, concepts, ideas, information pertaining to the project, and anything discussed regarding the project with dates & initials of those present. The journal is a working document; so, neatness is not important though it must be legible and dated. This may be reviewed each Tuesday during the staff meetings.

Progress Reports: Each team must submit a weekly progress/status report (includes up-to-date “Gantt with milestones”) to both the project sponsor (via FAX or email) and to the instructor and TA. A summary of the team's progress and a weekly “Things-To-Do(TTD)” list with finish dates and responsibility must be included and will be discussed each Tuesday during the staff meetings. This is usually a bulleted list or spreadsheet and is about one page in length. It describes the team's accomplishments and what is planned in the immediate future. Submit an electronic copy to the instructor (via drop box on CANVAS) by noon on Monday before the Tuesday class. Be honest about who was in attendance, hours spent by each team member that week and on what, and your assessment of the team's progress, and be aware that minor delays in the beginning cause major problems at the end.

Labor Division: After the teams have formed, members will prepare a document showing division of labor and ground rules. This will be documented in your notebook and in your first progress report. Effective teamwork is essential in this class.

Literature/Patent Search: This provides you with background information and a summary of what has been previously done on the topic. The engineering library is a good place to start the literature survey, while the patent search can be quickly done in the patent room in Davey Lab or the various free online sites that access USPTO, http://www.libraries.psu.edu/psul/researchguides/matbytype/patents.html. I would suggest you first use the online tutorial prior to your effort, http://www.libraries.psu.edu/instruction/business/Patents/index.html, as the tutorial will expedite your searches. They have paper copies and discs in the library covering patents for the last century. Note that finding patents prior to 1976 will involve a bit more work than later patents. Please do not think that simply searching various web sites is sufficient.

Manufacturing Resources: The Learning Factory, the basement of Reber, and the IE lab in Leonhard Building have machine shops for construction. Testing and storage may be arranged with the lab managers. Ensure you are certified (e.g. see Learning Factory (LF)) to operate equipment prior to starting. If you anticipate needing to use the equipment in these labs, arrange for the training and certification early in the semester, as the lab technicians are normally heavily loaded toward the end of the semester. Specialized training in machining and welding is available, see http://www.lf.psu.edu/lf/train.htm. Do not miss out on this opportunity even if your project does not require machining.

Software Resources: PCs at the LF, ME and ESM computer studios have Microsoft Project for Gantt Charts. Solidworks® for solid modeling and shop drawings can also be accessed in the ESM computer studio as well as 315 Hammond Sunday through Thursday evenings from 7:00PM-11:00PM. Note for planning purposes in Hammond: a TA will be available for assistance, but be mindful that the room is partially vacant the first two thirds of the semester but is generally full the last one third.

Project Proposal/Statement of Work (SOW) Report: This report is a marketing document and not a highly technical document. It should include an executive summary, problem
statement, literature review/patent searches, project objectives, preliminary design concepts with 3 or more alternatives, budget estimates, Gantt charts, citations etc. See the LF web site for a template and details. The SOW, DSR, and Final Report will also have a paragraph addressing how environmental and ethical standards were followed from the start of the project. First or third person is acceptable for the reports. Hard copy must be delivered to class on the due date (see syllabus) as well as an electronic copy submitted to the drop box in CANVAS.

• Design Specifications Report (DSR): This report should include executive summary, problem statement, quantitative design specifications, justification with concept selection matrix, engineering drawings, analysis, manufacturing process plan, evaluative test procedures, remaining work to do, updated Gantt chart, budget report, references, and appendix. See the LF web site for template and details. Hard copy must be delivered to class on the due date (see syllabus) as well as an electronic copy submitted to the drop box in CANVAS.

• Final Report: This report should include information from the DSR along with updated solid models, updated shop drawings, photographs of prototype(s), test results plus final economic results, construction details, manufacturing considerations and improvements, conclusions and recommendations. See the LF web site for template and details. Hard copy must be delivered to class on the due date (see syllabus) as well as an electronic copy submitted to the drop box in CANVAS.

• Oral Presentations of the SOW and Final Reports: Will be judged by the instructor and by the students on preparation, visual aids, stage presence, and overall effectiveness. Each individual shall participate in the presentation, with the team's total presentation about 20-25 minutes including class discussion and reflection. Time allotted may vary depending upon groupings and number of groups. Submit the presentations prior to class in the appropriate drop boxes on CANVAS.

• Peer and Self Assessments: Additionally, you will be asked to provide an individual, self assessment as well as an assessment of each of your team members. This is an opportunity to consider your contributions to the team as well as rate the contributions of the other team members. Individual input will be anonymous, but the overall messages will be compiled to provide constructive criticism to the team members. Additional guidance is on CANVAS.

• Team Self Assessment: Your end product or process will be evaluated on how effectively it satisfied the customer needs. Additionally, your work should demonstrate an appreciation of any possible global and societal, safety or sustainability implications. You will be asked to rate your team's performance on each of these targets on a scale of 1 to 10 in an appendix of the final report. An accompanying paragraph is necessary for justification.

• Poster Presentation: There will be one poster presentation at the project showcase at the end of the semester. Use the Engineering Copy Center in the Engineering Units Building. Ensure that the text is large and uncluttered. The title, figures, text, names, and conclusions should be able to be read by someone standing 4 ft. away. Dark backgrounds are not recommended.

• Project Recap: This is a one-page executive summary of the project that provides an overview, list of objectives, and a summary of the approach and project outcomes. One or two pictures should also be included to highlight the prototype, test results, etc. from your project. A template will be provided on the LF web site. If you signed an IP form confidentiality may be an issue, so the sponsor should approve the Project Recap as a courtesy.

• Safety: Safety in the Laboratory and/or shops is the highest priority. Training is available from the lab/shop managers. Assure that you take the mandatory training, abide by the safety rules and guidelines, and schedule adequate time to avoid rushing through your work.
Reimbursement: The total budget, including travel expenses, is $1000 per project with a $50/vendor/day limit. Anything over $50 requires Cindy Winkelblech to place the order. It is mandatory to have the original receipts initialed by the instructor prior to submission for reimbursement. Purchase requests should include: your name, local address, email address, team name, and sponsor name. It is highly recommended that you work with Cindy in Leonhard Building to use the Penn State purchasing card, as it is the fastest method and least amount of paperwork for you and them. Petty cash of up to $50 can be attained weekly. If you have multiple petty cash receipts that total more than $75 for a given week, your reimbursement will be issued via check and take about two weeks to process. Meals, taxi in State College, and clothing will not be reimbursed. Postage will not be reimbursed; Cindy will mail things for you. Telephone calls should be made from the conference room in 312 Leonhard Building (see Cindy to reserve it) or the Learning Factory. If you call from your residence, the bills are reimbursable if you have the original phone bill.

Instructor’s and Student’s Roles: The instructor is there to assist you in locating information and act as a coach or consultant on technical issues, but will not tell you which option to use in your final design. The design problems specified by your sponsor are just the tip of the iceberg. It is your responsibility to further define the problem by discussing it with your sponsor. Excellent student teamwork and communication are essential in this class!

Deliverables to the Learning Factory Office (314 Leonhard Bldg.): These requirements must be met before final funds are reimbursed.

- Intellectual Property and/or Non-Disclosure Agreement forms (if applicable with sponsored project)
- A one-page Project Recap (DOC & PDF) that includes 1-2 photos from the project.
- Final poster – mandatory size: 32”x40” foam board, portrait oriented. Posters from previous semesters are on display on the 2nd floor of Reber and the 3rd floor of Leonhard Building.
- Copy of poster in PowerPoint® (PPT) & PDF formats, plus copies of SOW, DSR & Final Reports in uncompressed PDF format to the Learning Factory office on a CD during finals week.

Relationship to ABET outcomes (based on the 2011-2012 criteria, as approved 10/30/10)
Through lectures and team projects, this course will expect the students to further develop and demonstrate capabilities in the following ABET criteria:

Student Outcomes
a) An ability to apply knowledge of mathematics, science, and engineering
b) An ability to design and conduct experiments, as well as to analyze and interpret data
c) An ability to design a system, component, or process to meet desired needs within realistic constrains such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
d) An ability to function on multidisciplinary teams
e) An ability to identify, formulate and solve engineering problems
f) An understanding of professional and ethical responsibility
g) An ability to communicate effectively
j) A knowledge of contemporary issues
k) An ability to use the techniques, skills, and modern engineering tools necessary for
Furthermore, some projects will provide opportunities to address the following Student Outcomes:

h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i) A recognition of the need for, and an ability to engage in life-long learning.

Other Considerations
Penn State welcomes students with disabilities into the University's educational programs. If you have a disability-related need for reasonable academic adjustments in this course, contact the Office for Disability Services (ODS) at 814-863-1807 (V/TTY). For further information regarding ODS, please visit the Office for Disability Services Web site at http://equity.psu.edu/ods/.

In order to receive consideration for course accommodations, you must contact ODS and provide documentation (see the documentation guidelines at http://equity.psu.edu/ods/guidelines/documentation-guidelines). If the documentation supports the need for academic adjustments, ODS will provide a letter identifying appropriate academic adjustments. Please share this letter and discuss the adjustments with your instructor as early in the course as possible. You must contact ODS and request academic adjustment letters at the beginning of each semester.

Course Schedule and Assignments
(Note: Items on the schedule are subject to change)

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>Deliverables</th>
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<tbody>
<tr>
<td>1</td>
<td>Tue</td>
<td>Course Introduction</td>
<td>Course Requirements</td>
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<td>Tips for Students</td>
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<td>Overview of projects.</td>
<td>Read project list at: <a href="http://www.lf.psu.edu/projects.pdf">http://www.lf.psu.edu/projects.pdf</a></td>
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<td>2</td>
<td>Tue</td>
<td>Fundamentals of project management</td>
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<td>Getting to know your team</td>
<td>Submit Project Application Form by 3:00PM; faculty will assign project teams after students submit forms</td>
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<td>Body Lanugage</td>
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<td>Team organization</td>
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<td></td>
<td>Preparation for site visit</td>
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<td>Select Tuesday Staff Meeting times</td>
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<td>Homework Assignment</td>
<td>Complete and return to instructor the drop/add form for this class</td>
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Thu 1/23  Project Planning
Budgets, expenditures, reimbursements  IP Form to LF, 314 Leonhard Bldg.
Visit with sponsor
LF safety training/certification

3  Tue 1/28  Staff Meetings  Weekly Status Report 1
    Thu 1/30  Team reports; facilities, software, leaders, managers
Creativity
Down-select decisions
Assign SOW

4  Tue 2/4  Staff Meetings  Weekly Status Report 2
    Thu 2/6  Effective Business Communication
Risk Assessments

5  Tue 2/11  Staff Meetings  Weekly Status Report 3
    Thu 2/13  Patents and IP  Submit SOW Draft to instructor

6  Tue 2/18  SOW team presentations
    Weekly Status Report 4
SOW presentations
    Thu 2/20
    Short Staff Meetings  Submit SOW to sponsor

7  Tue 2/25  Staff Meetings  Weekly Status Report 5
    Thu 2/27  Solid models, shop drawings, dimensions, tolerances
Design Optimization
Assign DSR

8  Tue 3/4  Staff Meetings  Weekly Status Report 6
Self/Peer Assessment due to instructor
    Thu 3/6
    Motivation in a Team Environment
Effective Meetings
Assign Self-Assessment

SPRING BREAK 3/8-3/16

9  Tue 3/18  Staff Meetings  Weekly Status Report 7
    Thu 3/20
    Engineering failures
Root Cause Analysis  Submit DSR draft to instructor

10  Tue 3/25  Staff Meetings  Weekly Status Report 8
    Thu 3/27  Safety, deviations, process, team decisions  Submit DSR to sponsor
11 Tue 4/1 Staff Meetings Weekly Status Report 9
    Thu 4/3 DFM/DFA Ethics

12 Tue 4/8 Staff Meetings Weekly Status Report 10
    Thu 4/10 Electrical Engineering Design Process
    Engineering Economics Review
    Class Requested Topics

13 Tue 4/15 Staff Meetings Weekly Status Report 11
    Thu 4/17 Consultations Posters to instructor for review

14 Mon 4/21
    Tue 4/22 Posters to Engr Copy Center for printing
    Staff Meetings USB or email eccarc@engr.psu.edu
    Weekly Status Report 12
    Thu 4/24 Class Requested Topics
    Final Report Discussion SRTEs

15 Sun 4/27

16 Tue 4/29 (end of the day)

Final Project Presentations Submit Poster, Draft Final Report, Draft Project Recap to
instructor via email or dropbox

Final Presentations
    Thu 5/1
    Project Design Showcase
    Bryce Jordan Center

Setup 10:00-11:30 AM
Judging & Safety 11:30 AM Showcase open to public
1:00-3:00 PM
Awards 5:30 BJC Annex Poster and prototype on display at Showcase

16 Sun 5/4
    Wed 5/7 Final Reports Due
    Final reimbursement submittal due
    Final Report (doc & pdf format), Project Recap, SOW, DSR, Poster File on CDROM