Engineering Faculty Council
Meeting Agenda
February 21, 2017
11:00 a.m.
101F Hammond Building (large conference room in Dean’s Suite)

1. Approval of minutes for the meeting of January 24, 2017
2. Dean’s Report (Amr Elnashai)
3. Updates from Undergraduate Studies Committee (Chris Giebink)
4. Updates from Graduate Studies Committee (Esther Gomez)
   • No items to report
5. Updates from Engineering Technology Committee (Engr Tech Chair)
6. Updates from Faculty Senate (Doug Wolfe)
7. Other Business
Meeting Minutes

1. Approval of minutes for the meeting of December 13, 2016
   Unanimously approved.

2. Dean’s Report (Amr Elnashai)
   - VRP: Lost 8 tenure-system professors, 1 none-tenure track professor and 13 staff due to VRP. In Oct, we asked 6 lines for emergency replacement, and got 4. In the 2nd round, we asked 11 more, and got 6.
   - Faculty and department head searches: 40 regular faculty lines and 2 frontier lines searches ongoing. Three department head searches, Computer Science (internal search), Aero and Architecture Engineering (external search). Computer Science: the interim head was hired as the new department head. AE: three candidates have visited the campus and the search committee will meet soon.
   - Climate Study: On-line forms were sent to students, faculty and staff. Two town halls, one for the faculty and one for the staff, on the findings of the climate study. The form assessment gives a number of things we need to work on. Amr asked the same committee to develop a plan of action. Five goals in this plan responding to the climate challenges. Each goal has 5-6 action items. The plan was sent to department heads first, and then sent to directors of offices, and then will be put on the website for everybody to comment on. Heads will meet to set priority of action items.
   - Global program: Global portfolio is growing. 3+1 program: students from overseas stay at their institute for the first three years, come to PSU as senior, but no PSU degree will be offered. PSU credit will be transferred to students’ home institute and students will get their bachelor’s degree from their home institutes. In the 3+2 program, students will continue in a one-year master program at PSU. Five 3+2 programs have been signed.
   - Buildings: Ground breaking last week for the BME/ChemE building. Working date is Jan 2019. The co-laboratory program is one of the top priorities at the university. By early summer we may have solid commitment for the co-laboratory program from the university.
   - Amr asks EFC to send him important items that need to be addressed before his departure (July 24-31).

3. Updates from Undergraduate Studies Committee (Chris Giebink).
   Nothing to report.
4. Updates from Graduate Studies Committees (Esther Gomez).
   - **Program Proposals:**
     - Approved:
       - PhD Program in Computer Science and Engineering – Changing course requirements for PhD in CSE
   - **Course Proposals:**
     - Approved:
       - EE 551 - Change
       - ME 566 - Add
   - **Graduate Faculty Nominations:**
     - Approved:
       - Stephane Butler Velegol, Category P, Chemical Engineering
       - Unanimously approved.

5. Updates from Engineering Technology Committee
   No items to report.

6. Updates from Faculty Senate (Doug Wolfe)
   - Next Faculty Senate meeting is Tuesday, January 24, 2017
   - At the senate council meeting the following discussion highlights were discussed by:
     **Nick Jones**, Executive Vice President and Provost:
     a. Michael Kubit – New VP for Information Technology and Chief Information Officer
     b. Donald Welch – New Chief Informational Security Officer, Office of Information Security
     c. Dean of PSU Law School appointed – Hari Osofsky, University of Minnesota
     d. Several national searches ongoing or soon to be initiated for various positions including:
        i. College of Engineering Dean
        ii. College of Earth and Mineral Science Dean
        iii. Schreyer Honors College Dean
        iv. University Budget Officer
        v. A few others
     e. Strategic plan Implementation. Thematic plans (5) will be held at various locations throughout the state. Will be available on line.

     **Blannie Bowen**, Vice Provost for Academic Affairs:
     f. PSU Laureate application – Accepting nominations. Please nominate folks.
     g. Jackie and Maggie – General Education leadership; holding sessions on General Education direction and reform.

     **Madlyn Hanes**, Vice President for Commonwealth Campuses and Executive Chancellor
     h. PSU Wilkes-Barre Chancellor position filled
     i. Getting close to filling Dubois campus chancellor position
Robert Pangborn, Vice President and Dean for Undergraduate Education

h. 60,000 applications to date. Both main and branch campuses are doing well.

i. ~20,000 offers are out. ~7000 to campuses and 12000 to University Park (this is by intention) so we don’t have too many students over enrolled at main campus this year.

j. Declines in international applications.

k. Discovery grant applications – Do research over the summer. Suitable Faculty Mentor. Call for applications for faculty in the student engagement network.

l. Raise Me scholarship program is being updated and improved. Looking favorably based on PA schools to encourage underrepresented students.

Marcus Whitehurst, Vice Provost for Educational Equity

m. Discussed various MLK Evening celebrations and events

Gerry – Consolidation of various Human Resources Business Process Transformation

n. Started in August of 2013

o. Reviewing all HR policy to make sure they are streamlined

p. Academic Policy – 23 policies will be combined into one. Looking at moving these policies from VP Human Resources to under Vice Provost for Academic Affairs. With the proposed realignment of policies, HR would still continue to administer the policies.

q. Compliance, Best Practicer. Meeting with leadership regarding communication/roll out of the policy consolidations/review 2

s. Consolidation of current policies without changes. For example, 13 deal with appointments, so it would be desired to combine them into one comprehensive policy. However, some policies are being reviewed and may be eliminated/changed based on review. There are numerous categories of policies including: Payroll, Research, HR, Academic, Budget, Travel, all sorts of different policies, etc. 9 over 12 contract only applies to academic roles.

Graduate Council discussion (STEIN)

t. Graduate Council – Issues on Master’s degree. Discussions regarding MS degrees to be annotated as whether they are by thesis, or class, or capstone system.

u. Some units believe that the standards of MS degrees are being lowered with some of the new MS degree programs.

• Significant Discussion regarding the following Forensic Sessions to be held:

  I. Senate Committee on Student Life, Counseling and Psychological Services for Students

  • Primary discussion revolved around what questions should be proposed for the forensic session. There was concern regarding the budgetary comments/discussion with regards to funding, etc. In short, it appears that even with the additional resources allocated in the past year, CAPS may not be meeting the needs of the student population.

  • CAPS is an essential service and program. How is it paid for? How to access the services and how to refer to students.

  • Two potential questions that may be proposed:

    1. “Is Penn State offering enough counselors, sessions, creative solutions, and resources to address our student mental health needs?”
2. “How can Penn State Faculty and our Faculty Senate foster a climate that best promotes Student Mental Health and access to support resources on campus?”
   • It appears that PSU is struggling to meet the demand.

II. Recommendations for standardization fixed term titles across units
   • This is related to previous legislation regarding fixed-term appointments and providing a path for promotion. Previously it was recommended that there be three levels for promotion for fixed term faculty similar to Faculty Ranks of Assistant Professor, Associate Professor, and Professor.
   • Modifications to HR21: Definitions of Academic Ranks. There was originally some Advisory/Consultative Legislation proposed to expand the existing promotion pathway for fixed-term faculty from two ranks to three. While at the time the report suggested allow units to determine titles for those ranges. Inconsistent title frequently lead to such confusion as to what the difference might exist between a lecturer and an instructor, whereas some titles are interchangeable for essentially equivalent position in some units. The report recommended standard titles.
   • However, there was significant push back and opposition from many units and Deans regarding the proposed legislation as many were not aware and administration is taking a step back to review. As a result, this was put as a Forensic session to determine whether or not there should be standard university titles or allow units to determine the titles within each unit. The categories were focused on teaching faculty with little to no discussion/input from the research faculty side.
   • Deans/Chancellors. They had a strong reaction.

III. Abington Resolution
   • They did not want to alter their resolution. There were potential issues with refugee versus sanctuary. Much of this stems from the 2016 presidential election campaign.

7. Other Business.

N/A.
Be 460 - Biological Engineering Design I

Submitted by: Megan Marshall and Jeffrey Catchmark

<table>
<thead>
<tr>
<th>Type and Description of Change</th>
<th>Description or Rationale for Curricular Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>BE 460 is currently a one-credit course and BE 466 is currently a three-credit course. The total content of the four-credit course sequence is not changing; however, the following changes are proposed:</td>
<td></td>
</tr>
<tr>
<td>(1) Change BE 460 to a writing-intensive course -- The focus of BE 460 is development of the design project proposal. Throughout the semester, the student teams submit drafts, receive instructor feedback, and revise until the final proposal is submitted at the end of the semester. Students also write a team agreement, update memos to project sponsors, and maintain a design notebook.</td>
<td></td>
</tr>
<tr>
<td>(2) Change BE 460 from a one-credit to a two-credit course -- The BE 460/466 course sequence is currently in its second offering. Based on the observations of the instructors and feedback from students, it was determined that the workload in BE 460 was equivalent to two credits (based on the recommended guideline of ~45 hours/credit). BE 460 involves formal lectures, team meetings with the instructors, plus time outside of class to meet with project sponsor, work on project proposal, and complete preliminary analyses for project.</td>
<td></td>
</tr>
<tr>
<td>(3) Change BE 466 from a three-credit to a two-credit course -- This proposed change is again based on instructor observation and student feedback in the previous offerings of the BE 460/466 course sequence. By spending extra time in BE 460 building a relationship with the project sponsor and completing preliminary design calculations, less time is spent in BE 466 refining the design specifications and completing the final design. BE 460 and BE 466 are only required for BE students and are only taken by BE students. Therefore, no external consultation was requested on these course change proposals. The proposals were approved by the ABE Undergraduate Studies Committee and by the ABE Faculty (confirmed by formal consultation with the ABE department head).</td>
<td></td>
</tr>
</tbody>
</table>
BE 466 is currently a one-credit course and BE 466 is currently a three-credit course. The total content of the four-credit course sequence is not changing; however, the following changes are proposed:

(1) Change BE 460 to a writing-intensive course -- The focus of BE 460 is development of the design project proposal. Throughout the semester, the student teams submit drafts, receive instructor feedback, and revise until the final proposal is submitted at the end of the semester. Students also write a team agreement, send update memos to project sponsors, and maintain a design notebook.

(2) Change BE 460 from a one-credit to a two-credit course -- The BE 460/466 course sequence is currently in its second offering. Based on the observations of the instructors and feedback from students, it was determined that the workload in BE 460 was equivalent to two credits (based on the recommended guideline of ~45 hours/credit). BE 460 involves formal lectures, team meetings with the instructors, plus time outside of class to meet with project sponsor, work on project proposal, and complete preliminary analyses for project.

(3) Change BE 466 from a three-credit to a two-credit course -- This proposed change is again based on instructor observation and student feedback in the previous offerings of the BE 460/466 course sequence. By spending extra time in BE 460 building a relationship with the project sponsor and completing preliminary design calculations, less time is spent in BE 466 refining the design specifications and completing the final design. BE 460 and BE 466 are only required for BE students and are only taken by BE students. Therefore, no external consultation was requested on these course change proposals. The proposals were approved by the ABE Undergraduate Studies Committee and by the ABE Faculty (as indicated by formal consultation with ABE department head).
| Change | The current prerequisite for this course is CMPSC122 or its equivalent, which students are recommended to take in the spring of their first year. CMPSC 442, however, is aimed primarily at juniors and seniors. It prepares juniors for data mining, machine learning, and AI topics such as vision, natural language processing and robotics. It prepares seniors for the job market or further academic studies so that their knowledge of standard AI algorithms is practical as well as theoretical. For students to learn to implement AI algorithms, they need to have experience with programming across several semesters of course work. The experience in object-oriented programming students gain in CMPSC 221 will prepare them for the more advanced problems in CMPSC 442. Because the students will have experience in both python and Java, it allows the instructor a choice between two object oriented languages. The homework assignments ask students to apply their programming skills to the solution of a wide range of search problems, puzzles, logical reasoning, and simple machine learning problems, such as text classification. The requested change to the pre-requisites makes it possible for AI to be a genuine computer science course in which students learn to implement rational agents through programming assignments, as opposed to a theoretical overview that includes more trivial programming assignments or questions. |
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>MEGAN MARSHALL</td>
<td>MNM11</td>
<td>Agricultural Sciences (AG)</td>
<td>Not Available</td>
</tr>
<tr>
<td>JEFFREY CATCHMARK</td>
<td>jmc102</td>
<td>Agricultural Sciences (AG)</td>
<td>Not Available</td>
</tr>
</tbody>
</table>

College with curricular responsibility: 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 460) Biological Engineering Design I

Course Information

Cross-Listed Courses:

Prerequisites:

BE 301, BE 391, 7th Semester standing

Corequisites:

Concurrents:

Recommended Preparations:

Abbreviated Title: Biol Eng Dsgn I

Discipline:

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

Common Course

GE Learning Objectives

GenEd Learning Objective: Effective Communication
GenEd Learning Objective: Creative Thinking
GenEd Learning Objective: Crit & Analytical Think
GenEd Learning Objective: Global Learning
GenEd Learning Objective: Integrative Thinking
GenEd Learning Objective: Key Literacies
GenEd Learning Objective: Soc Resp & Ethic Reason

Bulletin Listing

Minimum Credits: 2
Maximum Credits: 2
Repeatable: NO
Department with Curricular Responsibility: Agricultural And Biological Engineering (UPEN_AGBE)
Effective Semester: Upon Approval
Travel Component: NO

Course Outline

A brief outline or overview of the course content:
BE 460 is the first in a two-course sequence where Biological Engineering (BE) students complete a capstone design project. The focus of BE 460 is on project selection, team organization, proposal development, and preliminary analyses. The ABE department identifies design projects from industry, faculty, and/or community initiatives (for example, Sustainable Communities Collaborative). Projects are matched to student teams based on specialization area or option within Biological Engineering. As students are organized into teams and work on project proposal, design considerations, such as safety, ethics, economics, and optimization, are also introduced. Design implementation then continues in BE 466 (Biological Engineering Design II), the second course in the two-course sequence.

A listing of the major topics to be covered with an approximate length of time allotted for their discussion:
The class meets once a week for two hours and covers the following topics:

Week 1 – Introduction and project selection
Week 2 – Team organization and conflict
Week 3 – Overview of product development
Week 4 – Intellectual property and searching
Week 5 – Customer needs & specifications
Week 6 – Concept generation & selection
Week 7 – Safety in engineering design
Week 8 – Design optimization (model formulations)
Week 9 – Design optimization (model solutions)
Week 10 - Economics
Week 11 – Professional ethics
Week 12 – Professional ethics
Week 13 -- Deliverables agreement
Week 14 – Presentation of project proposal
Week 15 – Presentation of project proposal

Course Description:
BE 460 is part one of a two course sequence that provides a culminating design experience for students in the Biological Engineering major. Students will develop skills and techniques for managing and executing engineering design projects in the following fields: agricultural engineering, food and biological processing engineering, and/or natural resource engineering. Projects are sponsored by faculty, industry, or community initiatives and are structured to span two semesters. In the Fall semester, the emphasis is on classroom lectures, preliminary analyses, and project proposal development. In the Spring semester, the emphasis is on hands-on laboratory activities, project execution, and report preparation. Project teams perform all facets of the design process. This includes problem identification, planning of the project, formulation of design specifications, development and evaluation of alternative conceptual designs, development of detailed designs, consideration of safety and design optimization, design implementation, design testing, and analysis and documentation of results. Students improve their writing skills through preparation and refinement of various documents including a design notebook, proposal, statement of work, design specification report, status reports, and a final report. Students also present their results in other formats, including poster and oral presentations for both technical and non-technical audiences.
The name(s) of the faculty member(s) responsible for the development of the course:

- Name: JEFFREY CATCHMARK (jmc102)
  Title: PROF AG & BIO ENG
  Phone: +1 814 863 0414
  Address: 0248 AG ENGR BLDG
  Campus: 
  City: 
  Fax: 

- Name: MEGAN MARSHALL (MNM11)
  Title: INSTR AG & BIO ENG
  Phone: +1 814 865 3392
  Address: 0224 AG ENGR BLDG
  Campus: 
  City: 
  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.
Upon completing this course, students should be able to:
- Investigate and document state of the art engineering information relevant to a design project
- Distinguish between a feasible and optimal design
- Develop a design proposal in collaborative, team environment
- Apply ethical principles to engineering design processes
- Develop and improve writing skills

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.
Writing assignments are indicated with a * below and make up ~50% of the final grade. The final grade will be based on:

*Homeworks - 20% (includes team agreement, proposal section drafts, etc.)
Sponsor evaluation - 10%
Peer evaluations – 15%
Proposal presentation – 15%
*Proposal report – 25%
Participation/Professionalism – 10%
*Update memos and electronic notebook - 5%

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.
Together, BE 460 (Biological Engineering Design I) and BE 466 (Biological Engineering Design II) make up the culminating design experience for senior BE students. In BE 460, students develop their design project proposals while in BE 466, student will refine the design specifications, implement their proposal, and document the final results. The prerequisites for BE 460 are BE 301, BE 391, and 7th semester standing. As a culminating experience, students must be prepared to apply engineering fundamentals and junior-level BE coursework to their design projects. For this reason, 7th semester (or senior) standing is a required prerequisite. BE 460 also requires students to prepare a technical project proposal and presentation. BE 391 (Contextual Integration of Communication Skills for the Technical Workplace) is a prerequisite since it is a GWS course for BE students where they develop technical writing and presentation skills. In BE 460, students are introduced to design optimization concepts, which requires tools introduced in BE 301 (Mathematical Modeling of Biological and Physical Systems) as a prerequisite.

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 460 (BE Design I) and BE 466 (BE Design II) are both required for BE students. Together, the two courses satisfy the writing across the curriculum requirement and the capstone design experience for BE students.

A description of any special facilities:
The Agricultural and Biological Engineering Department houses a fabrication shop and computer lab to support simulation and prototyping for the design projects.

Frequency of Offering and Enrollment:
The course will be offered every fall semester. Expected enrollment is <50 BE seniors.

Justification for Changing The Proposal:
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 changes should be submitted.

BE 460 is currently a one-credit course and BE 466 is currently a three-credit course. The total content of the four-credit course sequence is not changing; however, the following changes are proposed:

(1) Change BE 460 to a writing-intensive course -- The focus of BE 460 is development of the design project proposal. Throughout the semester, the student teams submit drafts, receive instructor feedback, and revise until the final proposal is submitted at the end of the semester. Students also write a team agreement, update memos to project sponsors, and maintain a design notebook.

(2) Change BE 460 from a one-credit to a two-credit course -- The BE 460/466 course sequence is currently in its second offering. Based on the observations of the instructors and feedback from students, it was determined that the workload in BE 460 was equivalent to two credits (based on the recommended guideline of ~45 hours/credit). BE 460 involves formal lectures, team meetings with the instructors, plus time outside of class to meet with project sponsor, work on project proposal, and complete preliminary analyses for project.

(3) Change BE 466 from a three-credit to a two-credit course -- This proposed change is again based on instructor observation and student feedback in the previous offerings of the BE 460/466 course sequence. By spending extra time in BE 460 building a relationship with the project sponsor and completing preliminary design calculations, less time is spent in BE 466 refining the design specifications and completing the final design.

BE 460 and BE 466 are only required for BE students and are only taken by BE students. Therefore, no external consultation was requested on these course change proposals. The proposals were approved by the ABE Undergraduate Studies Committee and by the ABE Faculty (confirmed by formal consultation with the ABE department head).

Writing Across the Curriculum (W,M,X,Y course suffixes)

A copy of the course syllabus:
BE 460 Syllabus Supervisors: Jeffrey Catchmark Megan Marshall Time/Location: TBD Course Description: B E 460 is the first of a 2-course capstone design experience. Through this experience, students develop skills and techniques for managing and executing engineering design projects. These skills are applied to a project sponsored by faculty, industry or other organizations. Project teams engage in all facets of the design process. This includes problem identification and clarification, planning of the project, formulation of design specifications, development and evaluation of conceptual designs, development of detailed designs, implementing the design, and analysis and documentation of results. The preparation and refinement of various documents including notebook entries, status reports, a design specification report, and a final report will allow students to improve their writing skills. Students may also travel to sponsor sites, where possible, to gain an understanding of existing processes and problems and to assess the sponsor’s needs. Course Objectives: Upon completing this course, students should be able to: 01. Interact with a sponsor (supervisor, co-worker, client) to formulate equitable design criteria (time, cost, specifications) for a meaningful engineering project 02. Develop an action plan to complete the project on time and within budget 03. Conceptualize systems to satisfy design criteria 04. Analyze technical and economic merits of design alternatives 05. Work effectively in a team that includes co-workers, customers and vendors 06. Communicate well using verbal, written and electronic methods 07. Develop and improve writing skills 08. Demonstrate professionalism in interactions with colleagues, faculty, and staff 09. Demonstrate an appreciation of economic, global, societal, and ethical issues 10. Demonstrate knowledge of contemporary issues Pre-requisites: BE 301, BE 391, 7th semester standing. Grading Table: Final grade will be based on: Homework assignments: 20% Peer evaluations: 15% Sponsor evaluation: 10% Proposal report: 25% Proposal presentation: 15% Update memos and electronic notebook: 5% Participation/professionalism: 10% Grading Scale: A ≥ 94% B ≥ 86% 70% ≤ C ≤ 74% 60% ≤ D ≤ 86% 86% ≤ B+ < 90% 70% ≤ C < 74% 70% ≤ A- < 86% 82% ≤ B- < 82% 60% ≤ D < 70% 86% ≤ B+ < 90% 70% ≤ C+ < 86% ≤ B ≤ 82% 60% ≤ D < 70% ≤ B < 86% 86% ≤ B+ < 90% 70% ≤ C ≤ 82% Course Policies: • Academic Integrity: Students are expected to abide by the College of Engineering’s Academic Integrity policy, http://www.engr.psu.edu/faculty-staff/academic-integrity.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. Regarding 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 on the date and time shown in the course schedule. Late submissions will NOT be accepted. • Grading Disputes: If a student feels that a report or assignment was graded unfairly or in error, please bring it to the instructor’s attention within one week after the graded material was handed back. Scores will not be reconsidered after this time period has elapsed. • Participation: Participation is expected during each class. As a professional courtesy, please inform the instructor prior to any anticipated legitimate class absences. Also see the Faculty Senate Policy on Class Attendance (42-27). The participation component of your final grade will be assessed in multiple ways: your attendance in class lectures, your participation in team meetings with the instructor, and your participation in in-class activities. • Cell Phones: Turn cell phones off upon entering classroom. Additional Course Requirements: • Project Notebook: Each team is responsible for organizing and maintaining an electronic project notebook throughout the semester (and to be continued in the spring semester). The notebook should be managed using Google Drive. The notebook should contain drawings, concepts, ideas, & anything discussed regarding the project (for example, hand drawings can be imbedded in the notebook as scans or photos). The journal is a working document so neatness is not important though it must be readable and dated. Notebook entries should be initialed by team member(s) to reflect individual contributions. The notebook will be reviewed periodically. • Progress Reports: Each student must submit a weekly progress/status report including an update on project sponsor and instructor. Be aware that minor delays in the beginning cause major problems at the end. • Labor Division: Groups will prepare a document showing division of labor and ground rules. This will be documented. Again, teamwork is essential in this class. • Proposal: The project proposal is a major deliverable for BE 460. See Canvases for template, details and evaluation rubric. • Oral Presentations: Will be evaluated based on preparation, visual aids, stage presence, and overall effectiveness. All team members should have a role and present a portion of the presentation. Time allotted may vary depending upon groupings and number of groups. See Canvases for template, details and evaluation rubric. • Self and Peer Assessment: Periodically throughout the course of the semester you will have the opportunity to assess your own performance, and your performance will be assessed by your peers. Peers will have the opportunity to assess your level of involvement, effort and productivity. This is an important component of your overall evaluation and worth 15% of your final grade. • Professionalism: You should conduct yourself with high professional standards and have an ethical and professional attitude within the discipline and in other disciplines where the course may be required within a major or used as a service course.
Writing across the curriculum: This course satisfies the writing across the curriculum graduation requirement, and as indicated above, includes several writing assignments. There are assignments that are designed to help you learn to write in your discipline. These include the progress reports and project proposal report. There are also assignments where you will write to learn about your design process or your team dynamics, such as the project notebook and self/peer assessments, respectively. In BE 460, writing is a developmental process. You start with drafts of proposal report sections; throughout the semester, you will receive feedback, document ideas and meetings in your project notebook, and edit your writing until you complete the project proposal report. Course deliverables: The following is expected at the conclusion of this course: • Copy of Proposal in both doc and pdf formats. • Copy of presentation in ppt format. • Course notebook.

2. A concise explanation of how the proposed course will fulfill each of the following criteria:

(a) 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 characteristically designed 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.

Writing assignments will be designed to balance learn to write and write to learn objectives. “Learn to write” assignments include the project proposal and weekly status reports, where student teams learn to prepare technical design and progress reports for the engineering discipline. Formal writing assignments such as these will be accompanied by a template and a rubric, so the expectations are clear (see more details under section 2d).

An example of a “write to learn” assignment is the electronic design notebook that the student teams will maintain. The design notebook will serve as one location where student teams can track resources as they find them, document key outcomes and action items from meetings, brainstorm ideas, and more. The design notebook will be informal but an important component of the design process.

(b) 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.

Written reports will develop and evolve throughout the semester, given the nature of the capstone design project. Student teams submit drafts of project proposal sections 1-4 and 5-7 before submitting the final project proposal at the end of the semester. After each draft is submitted, students receive feedback from instructor. Throughout the semester, students will be writing, editing, and rewriting. Students will also be maintaining a design notebook throughout the semester. This will be less formal but will assist teams in tracking important project information and resources to support report preparation.

(c) 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 will 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.

At the start of BE 460, each project team creates a folder in Google Drive to share with all team members and instructors. The design notebook and all writing assignments are kept in this folder for both BE 460 and BE 466. For writing assignments, teams will receive feedback in the form of instructor comments in the document and rubric scores/comments. There will also be the opportunity to discuss and review writing assignment feedback in the weekly team meetings with the instructor. In addition to instructor feedback, student teams will also receive feedback from sponsors on key writing assignments, such as the project proposal and design specifications report. Since the reports build throughout the semester, this feedback will be incorporated in the next submission.

(d) 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.

Prior to the start of a writing assignment, students will be provided with a sample and/or template, as well as a detailed grading rubric. For example, students will receive a template and samples for project proposal report. The rubric contains the following categories: technical content, style/audience (professional vocabulary/style, written for specified audience), structure (organization, formatting/ incorporation of tables/figures), clarity (easy to read, uniform writing style), mechanics (spelling, punctuation, grammar). As indicated in the course change proposal, various writing assignments make up about 50% of each student’s final grade.

One or two examples of the actual writing assignment sheets the instructor plans to use in the course.

Template for team technical report is provided below (all tables/figures have been removed for easier viewing). The sections make up the project proposal (BE 460), design specifications report (BE 466), and final design report (BE 466).
Show Team name and Report name

Show picture of topic on front page

Signature % effort on report (total 100%)
First Author %
Second Author %
Third Author %
Fourth Author %
Fifth Author %

NOTE: The proposal (pages 1-8 of this template) is completed in BE 460. The proposal is the starting point in BE 466. Also, when preparing your proposal (BE 460), design specifications report - DSR (BE 466W) or final report (BE 466) please do not include the instructional text below. You are to submit a polished report with your own writing.

Executive Summary
The report should start with an Executive Summary (or also known as an Abstract) of approximately 200-400 words, summarizing the objective, contents, results, and conclusions as specifically as possible. The heading of the Executive Summary should be italic. This MUST be updated for subsequent reports with previous report data updated also. This essentially encompasses all of what an executive may read, so summarize what the major results are in this report in this paragraph.

Table of Contents
List paragraph numbers and indented subparagraph numbers and topic names in a column. Also list the appropriate page numbers of the paragraphs on the right side of the page.

1.0 Introduction
The entire body text of the report should be Times New Roman, 12, and justified. Major headings should be numbered consecutively, 1.0, 2.0, 3.0, etc, typed in bold face with a font size of 16. Sub-headings should be numbered consecutively, 1.1, 1.2, etc, typed in bold face with a font size of 14. Finally, sub-sub-headings should also be numbered consecutively, 1.1.1, 1.1.2, etc., typed in bold face with a size 12 font face. It is not recommended to go beyond three levels of headings.

Tense should be appropriate for the section and stage of the report. For example, the proposal may have content which describes what will be done rather than what has been done. The final report will not have any future tense except for future work.

Finally, make sure that your report has page numbers from the second page through the appendix. This is often forgotten. Correct presentation is essential, so turn in a professional report!

1.1 Initial Problem Statement
Provide a brief paragraph describing your initial problem statement and the importance of the problem. Provide background information to educate the reader. Most of this should come from the problem statement that you received from your sponsor.

Supply a brief description of the sponsor, if applicable.

1.2 Objectives
Provide in paragraph form a general explanation of what you expect your design will and will not show. This section contains the scope of work and limitations of your future design. (This is a difficult paragraph to write, but ensures that you are thinking clearly on general objectives and how you intend to address them.)

2.0 Sponsor Needs Assessment

2.1 Gathering Input
This section will describe the manner in which you gathered information from your sponsor or associated sources. Remember, engineering design projects require quantification! Specifications like “the system needs to be fast, efficient, light, cheap, robust, and simple” are merely starting points but by themselves useless in design. You want to get as much quantitative information from your sponsor as possible and identify what you don’t know and must quantify. Your sponsor may not have every answer, which will require your team to develop these specifications. Quantification is critical! It is a foundation of engineering.

2.2 Weighting of Customer Needs
To create a weighted hierarchal customer needs list use a pairwise comparison chart as shown in Table 1. You first have to develop a list of customer needs based on your interactions with your sponsor and your own insights (e.g., has your sponsor missed anything which needs to be discussed?). Note, the needs listed in Table 1 are just examples. Yours may be much different. In this section you should detail how you developed a weighting for the customer needs. For example, for the case in Table 1 you would have to detail why would ease of use be less important (1.00) than ease of manufacturing (3.00). The greatest value of the pairwise comparison chart is the discussion it generates amongst team members as you try to assess what needs are most important (the same is true for many of the tables in the proposal) – do not assign this table to one team member to complete, rather work on it as a team!

All figures are numbered consecutively with figure captions typically placed at the bottom of the figure. Tables are also numbered consecutively with table captions at the top of the table. The pairwise comparison chart calculations should be done in MS Excel as it makes your life easier and the table can be selected, cut-and-paste from Excel into your report.

3.0 External Search
There are many sources of information that your team can use to educate yourselves and advance your project. You will have to do some independent learning to make your project successful. This is standard practice in any job, i.e., your university degree is the start of your education, not the end. Sources include journal articles, patents, books, written application notes, written industry standards, industry codes, product catalogues, and web resources. You should perform a literature search to obtain relevant information for your project. For example, patents contain a wealth of very specific information on devices and processes that can guide product or process development. Product catalogues often contain technical information on how products work, and can show you existing/competing products whose performance may need to be benchmarked against your specifications. Industry standards can detail important measurement procedures. Obtaining background information is essential for efficient execution of a design project. There is no benefit derived from spending time and resources ‘reinventing the wheel’.

You should perform a literature search that is relevant to your specific project. Your report should include each section below where some options exist to customize your report based on your project type. For example, teams working on devices should certainly conduct a patent search. However, teams working on a natural resources project may benefit from searching industry standards or application notes. Use your best judgement but don’t exclude something just to shorten the task. The more effort you invest into this section, the easier your project will be.
For example, if you will be generating a cost estimate on a
The Bill of
progress.
Develop a timeline with milestones for your project work. Include a Gantt chart with milestones, tasks and responsibilities as well
7.7 Timeline
conference calls.
Specify the interaction with your sponsor. Provide a listing of the schedule and the form of communication whether it is visits or
7.6 Communication and Coordination with Sponsor
channel design, you could include information here on what costs will be included and what sources will be used.
relevant to the economic analysis you will complete in BE 466W.
Materials (BOM) should be included in the appendix, if applicable.
report as more information is known up to the final report where all funds are known. The Final Report will not contain any
7.1 Budget and Vendor Purchase Information
Provide a description of your budget, if applicable, and how these project funds will be spent. This budget will be updated in each
report as more information is known up to the final report where all funds are known. The Final Report will not contain any
7.2 Project Management
Discuss project management approach and team capabilities. List your resumes in the Appendix. Include a deliverables agreement in the Appendix. Summarize how, with your management and technical skills, you will fulfill the project objectives. Provide a brief paragraph of major work that has to be completed before the end of the project (for proposal and DSR only).
7.3 Risk Plan
Discuss how your team will ameliorate or lessen any safety problems, if applicable. Risk factors can be marketing risk, technical
risks, manufacturing risks, schedule risks or reliability risks but all are generally reducible to financial risk to the company or to the community. Provide a paragraph that identifies the critical path and one that also describes the risk plan table. See example of Risk Plan Table 6.
7.4 Ethics Statement
Provide a paragraph of how your team will abide by established ethical standards. This can be in this section or in the Appendix.
7.5 Environmental Statement
Provide a paragraph of how your team will meet or exceed environmental standards. This can be in this section or in the Appendix.
7.6 Communication and Coordination with Sponsor
Specify the interaction with your sponsor. Provide a listing of the schedule and the form of communication whether it is visits or conference calls.
7.7 Timeline
Develop a timeline with milestones for your project work. Include a Gantt chart with milestones, tasks and responsibilities as well
as a short paragraph introducing the Gantt chart. Show enough detail to be meaningful and aid your team in making continued progress.
8.0 Detailed Design
The subsections below are outlined for a project that involves developing a design, prototyping (building), and testing. However, your project may require you to create a conceptual design but not build a physical prototype. For example, your project may require you to complete an analysis of multiple conceptual design alternatives in which case you may decide to have one subsection for each design. The subsections in 8.0 and 9.0 can be adjusted and re-ordered for your specific project but you must cover the following topics: engineering analyses completed for your design(s) (e.g., the detailed analyses completed to determine dimensions of open channel), description of the selection and/or optimization process for materials and/or components, procedure developed to test design (testing can be simulation-based), discussion of test results, detailed design drawings and/or schematics, and economic analysis.

8.1 Detailed Analysis
What theoretical analyses were necessary to prove your design? Provide results of any calculations or computer simulations that you did. If you perform a Finite Element Analysis ensure that you also have done a hand calculation to verify the order of magnitude results or experimental results. Did you have to make an initial prototype to prove an unknown concept or assembly method? If so, describe what you did. Summarize the results with reference to the output data in the Appendix.

8.2 Material and Component Selection
What materials or software were chosen for the major parts of the prototype or design? If applicable, what components were chosen for the major parts of the prototype or design?

8.3 Selection Process and Design Optimization
Describe the process you went through for picking the materials for the prototype or design, i.e., what tradeoffs (availability, cost, strength, flexibility, machinability, weldability, green material, recyclability, etc.) were the driving factors. Describe the process you went through for picking the components for the prototype, i.e., what tradeoffs (availability, cost, ergonomics, features, speed, size, green material, etc.) were the driving factors. If applicable, explain a quantitative optimization analysis performed to select a material or size a component in your design.

8.4 Drawings
Provide detailed professional drawings that quantify your detailed design. For example, CAD drawings could be used for a mechanical part. The vast majority of the details and shop drawings should be placed in the appendix. The drawings should be appropriately noted to be viewed in the appendix. All assemblies and parts drawings should be included. These drawings should be modified in the Final Report if during the assembly or machining phase there was a need for revision.

8.5 Test Procedure
Describe your experimental or simulated test procedures. Be specific on how you intend to evaluate/test your solution. This should be a well thought-out procedure with details on how you will test the parts or design for meeting the customer's needs. This is not just a basic statement stating that the parts will be tested to meet some customer requirements, but a list of detailed steps of what you will be doing and what equipment you will be using.

8.0 Final Discussion
9.1 Implementation Process
Provide enough implementation or construction detail such that a person could reproduce the design from your description and pictures. Pictures during the construction process are very informative. A few pictures can be inserted here but most should be in the Appendix. Again, if any improvements were made or if any drawings changed from the earlier detailed design report then replace old drawings with new drawings.

9.0 Economic analysis
An economic analysis should be performed demonstrating the value of your design. For example, you may perform a net present value (NPV) analysis for a product or system you developed. State all assumptions. Include analysis as shown in Table 7. In some cases, you may not be able to obtain accurate information, in which case you can provide your best estimate.

10.0 Conclusions and Recommendations
Add concluding thoughts that summarize your project, tying your final design back to the customer needs and specifications. This should show the process from beginning to end and finish with recommendations of what would be done to improve the next version.
of this project. In the appendix, rate your team in two (2) areas on a scale from 1-10 in each category, where 10 is meeting all needs in Design Criteria Satisfaction. This is twofold; you must rate yourself on meeting the customer’s needs as well as the impact of your engineering solutions on global and societal needs. First, rate yourself on meeting the customer needs and then generally write a short paragraph how your design met those needs. Second, rate yourself on global and societal needs which your team’s solutions have met and to what level. Write an accompanying paragraph about some specific decisions you made during the project and how the global and societal needs were met. These global and societal needs may involve safety, environment, sustainability, bioethics or basic human needs.

References (Times New Roman, 14, Bold)
Note: That for the author-date system, references are listed in alphabetical order.

Appendix: (listed in sections A, B, C, D, ...)
SolidWorks working drawings and a BOM of the final design should be placed in an appendix. Additional paragraphs concerning resumes, established communication dates with sponsor, calculations, patent search details, ethics and environmental statements may also be included here. If other items are too bulky, the vast majority of these tables, graphs, other should be listed here. Note these items should be listed in the proper paragraphs and then referenced to see details in the appendix, page ___.

NOTE: End of Final Report
SCCA Representative

Recipient Name: **ROBERT MELTON**  
Position: SCCA Representative  
Campus: UNIVERSITY PARK CAMPUS

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

Dean of the College

Recipient Name: **PIETER BUTLER**  
Position: Dean of the College  
Campus: UNIVERSITY PARK CAMPUS

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

SCCA Subcommittee Review

Recipient Name: **CORTNEY SMITH**  
Position: SCCA Subcommittee Review  
Campus: UNIVERSITY PARK CAMPUS

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

Recipient Name: **CYNTHIA ZOOK**  
Position: SCCA Subcommittee Review  
Campus: UNIVERSITY PARK CAMPUS

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

Recipient Name: **KADI CORTER**  
Department: (Not Available)
<table>
<thead>
<tr>
<th>Position: SCCA Subcommittee Review</th>
<th>Campus: UNIVERSITY PARK CAMPUS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title:</strong></td>
<td></td>
</tr>
</tbody>
</table>

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

### SCCA Review

<table>
<thead>
<tr>
<th>Recipient Name: CORTNEY SMITH</th>
<th>Department: (Not Available)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position: SCCA Review</td>
<td>Campus: UNIVERSITY PARK CAMPUS</td>
</tr>
<tr>
<td><strong>Title:</strong></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Recipient Name: CYNTHIA ZOOK</th>
<th>Department: (Not Available)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position: SCCA Review</td>
<td>Campus: UNIVERSITY PARK CAMPUS</td>
</tr>
<tr>
<td><strong>Title:</strong></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Recipient Name: KADI CORTER</th>
<th>Department: (Not Available)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position: SCCA Review</td>
<td>Campus: UNIVERSITY PARK CAMPUS</td>
</tr>
<tr>
<td><strong>Title:</strong></td>
<td></td>
</tr>
</tbody>
</table>

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

### Faculty Senate Review

<table>
<thead>
<tr>
<th>Recipient Name: CORTNEY SMITH</th>
<th>Department: (Not Available)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position: Faculty Senate Review</td>
<td>Campus: UNIVERSITY PARK CAMPUS</td>
</tr>
<tr>
<td><strong>Title:</strong></td>
<td></td>
</tr>
</tbody>
</table>

| 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

---

<table>
<thead>
<tr>
<th>Concur:</th>
<th>[Not Yet Reviewed]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comments:</td>
<td>[Not Yet Reviewed]</td>
</tr>
<tr>
<td>Reviewed On:</td>
<td>[Not Yet Reviewed]</td>
</tr>
</tbody>
</table>

---

**Curricular Information**

- Blue Sheet Item #:  
- Review Date: 

---

**SCRID Numbers**

- (BE 460):

---

**Uploaded Documents:**

- **Context Type:** Syllabus  
  - **File Description:** BE 460 Syllabus  
  - **File Name:** BE_460_Syllabus.pdf

- **Context Type:** Supporting Documents  
  - **File Description:** Writing Assignment Example (BE 460-466 Report)  
  - **File Name:** BE 460-466 reports.pdf
UPLOADED DOCUMENTS FOLLOW:
Supervisors:  

**Jeffrey Catchmark**, 308 Forest Resources Laboratory  
Telephone: 814-863-0414; email: jmc102@engr.psu.edu  
Office hours: 4:00pm-5:30pm Tuesday, by appointment or drop in anytime!

**Megan Marshall**, 310 Forest Resources Laboratory  
Telephone: 814-865-3392; email: mnm11@engr.psu.edu  
Office hours: See Starfish (starfish.psu.edu) or e-mail/call for appointment

**Time/Location:** Tuesday, 6:00pm to 7:55pm, 107 School of Forest Resources Building

**General project resources and information available on Canvas.**

**Course Description:**  
B E 460 is the first of a 2-course capstone design experience. Through this experience, students develop skills and techniques for managing and executing engineering design projects. These skills are applied to a project sponsored by faculty, industry or other organizations. Project teams engage in all facets of the design process. This includes problem identification and clarification, planning of the project, formulation of design specifications, development and evaluation of conceptual designs, development of detailed designs, implementing the design, and analysis and documentation of results. The preparation and refinement of various documents including notebook entries, status reports, a design specification report, and a final report will allow students to improve their writing skills. Students may also travel to sponsor sites, when possible, to gain an understanding of existing processes and problems and to assess the sponsor's needs.

**Course Objectives:** Upon completing this course, students should be able to:

01. Interact with a sponsor (supervisor, co-worker, client) to formulate equitable design criteria (time, cost, specifications) for a meaningful engineering project
02. Develop an action plan to complete the project on time and within budget
03. Conceptualize systems to satisfy design criteria
04. Analyze technical and economic merits of design alternatives
05. Work effectively in a team that includes co-workers, customers and vendors
06. Communicate well using verbal, written and electronic methods
07. Develop and improve writing skills
08. Demonstrate professionalism in interactions with colleagues, faculty, and staff
09. Demonstrate an appreciation of economic, global, societal, and ethical issues
10. Demonstrate knowledge of contemporary issues

**Pre-requisites:** BE 301, BE 391, 7th semester standing.

**Grading Table:** Final grade will be based on:

- Homework assignments: 20%
- Peer evaluations: 15%
- Sponsor evaluation: 10%
- Proposal report: 25%
- Proposal presentation: 15%
- Update memos and electronic notebook: 5%
- Participation/professionalism: 10%

**Grading Scale:**
Course Policies:

- **Academic Integrity**: Students are expected to abide by the College of Engineering’s Academic Integrity policy, [http://www.engr.psu.edu/faculty-staff/academic-integrity.aspx](http://www.engr.psu.edu/faculty-staff/academic-integrity.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. 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 on the date and time shown in the schedule. Late submissions will NOT be accepted.

- **Grading Disputes**: If a student feels that a report or assignment was graded unfairly or in error, please bring it to the instructor’s attention within one week after the graded material was handed back. Scores will not be reconsidered after this time period has elapsed.

- **Participation**: Participation is expected during each class. As a professional courtesy, please inform the instructor prior to any anticipated legitimate class absences. Also see the Faculty Senate Policy on Class Attendance (42-27). The participation component of your final grade will be assessed in multiple ways: your attendance in class lectures, your participation in team meetings with the instructor, and your participation in in-class activities.

- **Cell Phones**: Turn cell phones off upon entering classroom.

Additional Course Requirements:

- **Project Notebook**: Each team is responsible for organizing and maintaining an electronic project notebook throughout the semester (and to be continued in the spring semester). The notebook should be managed using Google Drive. The notebook should contain drawings, concepts, ideas, & anything discussed regarding the project (for example, hand drawings can be imbedded in the notebook as scans or photos). The journal is a working document so neatness is not important though it must be readable and dated. Notebook entries should be initialed by team member(s) to reflect individual contributions. The notebook will be reviewed periodically.

- **Progress Reports**: Each team must submit a weekly progress/status report including an updated schedule to both the project sponsor and instructor. Be aware that minor delays in the beginning cause major problems at the end.

- **Labor Division**: Groups will prepare a document showing division of labor and ground rules. This will be documented. Again, teamwork is essential in this class.

- **Proposal**: The project proposal is a major deliverable for BE 460. See Canvas for template, details and evaluation rubric.

- **Oral Presentations**: Will be evaluated based on preparation, visual aids, stage presence, and overall effectiveness. All team members should have a role and present a portion of the presentation. Time allotted may vary depending upon groupings and number of groups. See Canvas for template, details and evaluation rubric.

- **Self and Peer Assessment**: Periodically throughout the course of the semester you will have the opportunity to assess your own performance, and your performance will be assessed by your peers. Peers will have the opportunity to assess your level of involvement, effort and productivity. This is an important component of your overall evaluation and worth 15% of your final grade.

- **Professionalism**: You should conduct yourself with high professional standards and have an ethical and positive professional interaction with the sponsor, team members, staff and instructors.

- **Safety**: Any use of department facilities requires the appropriate safety training. Your instructor will review this safety training at the start of the semester.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>≥ 94%</td>
</tr>
<tr>
<td>82% ≤</td>
<td>B</td>
</tr>
<tr>
<td>70% ≤</td>
<td>C</td>
</tr>
<tr>
<td>90% ≤</td>
<td>A-</td>
</tr>
<tr>
<td>78% ≤</td>
<td>B-</td>
</tr>
<tr>
<td>60% ≤</td>
<td>D</td>
</tr>
<tr>
<td>86% ≤</td>
<td>B+</td>
</tr>
<tr>
<td>74% ≤</td>
<td>C+</td>
</tr>
<tr>
<td>F</td>
<td>&lt; 60%</td>
</tr>
</tbody>
</table>
Instructor, sponsor and student roles: The instructor is there to assist you in locating information and act as a coach or consultant on technical issues, but will not make design decisions for you. The design problems specified by your sponsor are just the start of the design process. It is the responsibility of the students and their team to further define the problem through effective interactions with their sponsor. Excellent student teamwork and communications are essential in this class!

Writing across the curriculum: This course satisfies the writing across the curriculum graduation requirement, and as indicated above, includes several writing assignments. There are assignments that are designed to help you learn to write in your discipline. These include the progress reports and project proposal report. There are also assignments where you will write to learn about your design process or your team dynamics, such as the project notebook and self/peer assessments, respectively. In BE 460, writing is a developmental process. You start with drafts of proposal report sections; throughout the semester, you will receive feedback, document ideas and meetings in your project notebook, and edit your writing until you complete the project proposal report.

Course deliverables: The following is expected at the conclusion of this course:
- Copy of Proposal in both doc and pdf formats.
- Copy of presentation in ppt format.
- Course notebook.
Show Team name and Report name

Date

Show picture of topic on front page

<table>
<thead>
<tr>
<th>Signature</th>
<th>% effort on report (total 100%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Author</td>
<td>______________________________</td>
</tr>
<tr>
<td>Second Author</td>
<td>______________________________</td>
</tr>
<tr>
<td>Third Author</td>
<td>______________________________</td>
</tr>
<tr>
<td>Fourth Author</td>
<td>______________________________</td>
</tr>
<tr>
<td>Fifth Author</td>
<td>______________________________</td>
</tr>
</tbody>
</table>

NOTE: The proposal (pages 1-8 of this template) is completed in BE 460. The proposal is the starting point in BE 466. Also, when preparing your proposal (BE 460), design specifications report - DSR (BE 466W) or final report (BE 466) please do not include the instructional text below. You are to submit a polished report with your own writing.

Executive Summary

The report should start with an Executive Summary (or also known as an Abstract) of approximately 200-400 words, summarizing the objective, contents, results, and conclusions as specifically as possible. The heading of the Executive Summary should be italic. This MUST be updated for subsequent reports with previous report data updated also. This essentially encompasses all of what an executive may read, so summarize what the major results are in this report in this paragraph.

Table of Contents

List paragraph numbers and indented subparagraph numbers and topic names in a column. Also list the appropriate page numbers of the paragraphs on the right side of the page.
1.0 Introduction

The entire body text of the report should be Times New Roman, 12, and justified. Major headings should be numbered consecutively, 1.0, 2.0, 3.0, etc., typed in bold face with a font size of 16. Sub-headings should be numbered consecutively, 1.1, 1.2, etc., typed in bold face with a font size of 14. Finally, sub-sub-headings should also be numbered consecutively, 1.1.1, 1.1.2, etc., typed in bold face with a size 12 font face. It is not recommended to go beyond three levels of headings.

Tense should be appropriate for the section and stage of the report. For example, the proposal may have content which describes what ‘will’ be done rather than what ‘has’ been done. The final report will not have any future tense except for future work.

Use the introduction section to provide some background information on your project. This introductory information should come from your literature search – Library, Internet, trade magazines, etc. All sources that are not your own ideas should be referenced. For your reports, please use the *parenthetical references: author-date system* (Ogot and Kremer, 2004, pg.71).

A sample reference list addressing each of the five main types of information sources is given at the end. These include: websites (Swanson, 1999), journals (Muriru and Daewoo, 2002), books (Zacharia and Daudi, 2001), conference proceedings (Peters et al., 2001) and patents (Wen-Cheng, 1994).

Finally, make sure that your report has page numbers from the second page through the appendix. This is often forgotten. Correct presentation is essential, so turn in a professional report!

1.1 Initial Problem Statement

Provide a brief paragraph describing your initial problem statement and the importance of the problem. Provide background information to educate the reader. Most of this should come from the problem statement that you received from your sponsor. Supply a brief description of the sponsor, if applicable.

1.2 Objectives

Provide in paragraph form a general explanation of what you expect your design will and will not show. This section contains the scope of work and limitations of your future design. (This is a difficult paragraph to write, but ensures that you are thinking clearly on general objectives and how you intend to address them.)

2.0 Sponsor Needs Assessment

2.1 Gathering Input

This section will describe the manner in which you gathered information from your sponsor or associated sources. Remember, engineering design projects require quantification! Specifications like “the system needs to be fast, efficient, light, cheap, robust, and simple” are merely starting points but by themselves useless in design. You want to get as much quantitative information from your sponsor as possible and identify what you don't know and must quantify. Your sponsor may not have every answer, which will require your team to develop these specifications. Quantification is critical! It is a foundation of engineering.

2.2 Weighting of Customer Needs
To create a weighted hierarchal customer needs list use a pairwise comparison chart as shown in Table 1. You first have to develop a list of customer needs based on your interactions with your sponsor and your own insights (e.g., has your sponsor missed anything which needs to be discussed?). Note, the needs listed in Table 1 are just examples. Yours may be much different. In this section you should detail how you developed a weighting for the customer needs. For example, for the case in Table 1 you would have to detail why would ease of use be less important (1.00) than ease of manufacturing (3.00). The greatest value of the pairwise comparison chart is the discussion it generates amongst team members as you try to assess what needs are most important (the same is true for many of the tables in the proposal) – do not assign this table to one team member to complete, rather work on it as a team!

All figures are numbered consecutively with figure captions typically placed at the bottom of the figure. Tables are also numbered consecutively with table captions at the top of the table. The pairwise comparison chart calculations should be done in MS Excel as it makes your life easier and the table can be selected, cut-and-paste from Excel into your report.

### Table 1. Example of a Pairwise Comparison Chart to Determine Weighting for Main Objectives/Categories. These will be specific to your project. This is just an example.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Safe</td>
<td>1.00</td>
<td>1.00</td>
<td>0.33</td>
<td>2.00</td>
<td>0.33</td>
<td>0.50</td>
<td>3.00</td>
<td>5.00</td>
<td>13.16</td>
<td>0.13</td>
</tr>
<tr>
<td>Ease of Use</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>0.33</td>
<td>1.00</td>
<td>1.00</td>
<td>4.00</td>
<td>4.00</td>
<td>13.33</td>
<td>0.13</td>
</tr>
<tr>
<td>Ease of Mfg</td>
<td>3.00</td>
<td>1.00</td>
<td>1.00</td>
<td>3.00</td>
<td>1.00</td>
<td>2.00</td>
<td>4.00</td>
<td>5.00</td>
<td>20.00</td>
<td>0.20</td>
</tr>
<tr>
<td>Cost</td>
<td>0.50</td>
<td>3.00</td>
<td>0.33</td>
<td>1.00</td>
<td>4.00</td>
<td>0.33</td>
<td>0.33</td>
<td>2.00</td>
<td>11.49</td>
<td>0.12</td>
</tr>
<tr>
<td>Efficient</td>
<td>3.00</td>
<td>1.00</td>
<td>1.00</td>
<td>3.00</td>
<td>1.00</td>
<td>3.00</td>
<td>4.00</td>
<td>5.00</td>
<td>21.00</td>
<td>0.21</td>
</tr>
<tr>
<td>Durable</td>
<td>2.00</td>
<td>1.00</td>
<td>0.50</td>
<td>3.00</td>
<td>0.33</td>
<td>1.00</td>
<td>2.00</td>
<td>3.00</td>
<td>12.83</td>
<td>0.13</td>
</tr>
<tr>
<td>Portable</td>
<td>0.33</td>
<td>0.25</td>
<td>0.25</td>
<td>0.50</td>
<td>0.25</td>
<td>0.50</td>
<td>1.00</td>
<td>0.50</td>
<td>3.58</td>
<td>0.04</td>
</tr>
<tr>
<td>Ergonomic</td>
<td>0.20</td>
<td>0.25</td>
<td>0.20</td>
<td>0.33</td>
<td>0.20</td>
<td>0.33</td>
<td>2.00</td>
<td>1.00</td>
<td>4.51</td>
<td>0.05</td>
</tr>
</tbody>
</table>

### 3.0 External Search

There are many sources of information that your team can use to educate yourselves and advance your project. You will have to do some independent learning to make your project successful. This is standard practice in any job, i.e., your university degree is the start of your education, not the end. Sources include journal articles, patents, books, written application notes, written industry standards, industry codes, product catalogues, and web resources. You should perform a literature search to obtain relevant information for your project. For example, patents contain a wealth of very specific information on devices and processes that can guide product or process development. Product catalogues often contain technical information on how products work, and can show you existing/competing products whose performance may need to be benchmarked against your specifications. Industry standards can detail important measurement procedures. Obtaining background information is essential for efficient execution of a design project. There is no benefit derived from spending time and resources ‘reinventing the wheel’.

You should perform a literature search that is relevant to your specific project. Your report should include each section below where some options exist to customize your report based on your project type. For example, teams working on devices should certainly conduct a patent search. However,
teams working on a natural resources project may benefit from searching industry standards or application notes. Use your best judgement but don’t exclude something just to shorten the task. The more effort you invest into this section, the easier your project will be.

3.1 Journal Articles (3 minimum)
Focus on peer-reviewed or professional journals.

3.2 Patents and/or industry standards/application notes (3 minimum)
Detail why the patent or other resource was important, i.e., what you learned and how you can apply it to your project.

3.3 Existing Products or Design Approaches (3 minimum)
Provide informative data as to what is on the market today or provide examples of what design approaches you have discovered and why they are important to your project.

3.4 Other sources (3 minimum)
These could be product catalogues, web sites, blogs, etc.

4.0 Engineering Specifications

4.1 Establishing Target Specifications and Specification Analysis
Provide a table (Table 2) of an initial set of target values that you established as a starting point for the project. Remember these are numbers with units. A specification is not “the design will be lightweight”. That is a qualitative description. A specification would be “the weight of the final unit is between 30 lbs and 55 lbs, or, more optimally, between 30 lbs and 40 lbs.” The limits of range could be values which cannot be exceeded. Provide a description of how and why you chose these values and how they relate to the customer’s needs.

Establishing specifications may also require an engineering analysis. For example, if a maximum flow rate needs to be specified, you may have to perform some fluid dynamics calculations to develop that specification. Such engineering analyses are expected in this report. You should include any engineering analysis used to develop your target specifications.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Limits of range</th>
<th>Ideal range or value</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power consumption</td>
<td>&lt; 350</td>
<td>&lt; 250</td>
<td>Watts</td>
</tr>
<tr>
<td>Weight</td>
<td>&lt; 100</td>
<td>&lt; 50</td>
<td>Lbs</td>
</tr>
<tr>
<td>Size</td>
<td>&lt; 1.0x0.5x0.2</td>
<td>&lt; 0.5x0.2x0.2</td>
<td>m (l x w x h)</td>
</tr>
<tr>
<td>Processing rate</td>
<td>&gt; 50</td>
<td>&gt; 100</td>
<td>Lbs/hour</td>
</tr>
<tr>
<td>Operating Temp.</td>
<td>0 to 60</td>
<td>-20 to 85</td>
<td>C</td>
</tr>
</tbody>
</table>

4.2 Relating Specifications to Customer Needs
Show a Needs-Metric s Matrix in a QFD that has customer needs, specifications and values as detailed in class. An example is provided below in Table 3.
Table 3: Need-Metrics Matric

| Metric | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 |
|--------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Need:  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 1      | * | * | * |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 2      | * |   |   | * | * |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 3      |   |   |   |   |   | * |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 4      |   |   |   |   |   |   | * |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 5      |   |   |   |   |   |   |   | * |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 6      |   |   |   |   |   |   |   |   | * | * |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 7      |   |   |   |   |   |   |   |   |   |   | * |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 8      |   |   |   |   |   |   |   |   |   |   |   | * |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 9      |   |   |   |   |   |   |   |   |   |   |   |   | |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 10     |   |   |   |   |   |   |   |   |   |   |   |   |   | * |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 11     |   |   |   |   |   |   |   |   |   |   |   |   |   |   | * |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 12     |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   | * |   |   |   |   |   |   |   |   |   |   |   |   |
| 13     |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   | * |   |   |   |   |   |   |   |   |   |   |   |
| 14     |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   | * |   |   |   |   |   |   |   |   |   |   |
| 15     |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   | * |   |   |   |   |   |   |   |   |   |
| 16     |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   | * |   |   |   |   |   |   |   |   |
| 17     |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   | * |   |   |   |   |   |   |   |
| 18     |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   | * |   |   |   |   |   |   |
| 19     |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   | * |   |   |   |   |   |
| 20     |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   | * |   |   |   |   |

5.0 Concept Generation and Selection

5.1 Concept Generation
Generate at least 3 concepts, but you may want to generate more. In the body of this section explain the concept. The figures should be neat and if mechanical, SolidWorks solid models are preferred. Note: many products available from, for example, McMaster Carr come with SolidWorks and other CAD models. You often do not have to create these!

5.1.1 Concept 1: concept name

5.1.2 Concept 2: concept name

5.1.3 Concept 3: concept name

5.2 Concept Selection and Analysis
Provide a Concept Scoring Chart as shown in Table 4 evaluating each of your concepts. This chart is used to help your team both develop (by collectively analysing the concepts, leading to new
concepts) and select the best concept. Discuss how concepts can potentially be combined to develop an improved concept meeting your customer's needs. A discussion of pros and cons of each design is required. Note that your selection criteria may be quite different than the examples shown in Table 4, but should match those that you developed for Table 1.

When developing and combining concepts, more detailed engineering analyses are typically required. For example, if power efficiency is a selection criterion, and your system requires a heat exchanger, a thermodynamic analysis may be required to select the best concept. Or if weight of a device is an issue, a structural analysis may be required to determine the best design requiring the least material. Such engineering analyses are expected in this report. You should include any engineering analysis used to develop and select your concepts.

**Table 4. Pugh Concept Scoring Chart example**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety*</td>
<td>0.13</td>
<td>3</td>
<td>0.39</td>
<td>3</td>
<td>0.39</td>
<td>3</td>
<td>0.39</td>
<td>4</td>
<td>0.52</td>
</tr>
<tr>
<td>Ease of Use</td>
<td>0.13</td>
<td>4</td>
<td>0.52</td>
<td>3</td>
<td>0.39</td>
<td>3</td>
<td>0.39</td>
<td>4</td>
<td>0.52</td>
</tr>
<tr>
<td>Ease of Mfg.</td>
<td>0.2</td>
<td>2</td>
<td>0.40</td>
<td>3</td>
<td>0.60</td>
<td>2</td>
<td>0.40</td>
<td>1</td>
<td>0.20</td>
</tr>
<tr>
<td>Cost</td>
<td>0.12</td>
<td>3</td>
<td>0.36</td>
<td>3</td>
<td>0.36</td>
<td>3</td>
<td>0.36</td>
<td>1</td>
<td>0.12</td>
</tr>
<tr>
<td>Efficient</td>
<td>0.21</td>
<td>4</td>
<td>0.84</td>
<td>3</td>
<td>0.63</td>
<td>4</td>
<td>0.84</td>
<td>4</td>
<td>0.84</td>
</tr>
<tr>
<td>Durable</td>
<td>0.13</td>
<td>2</td>
<td>0.26</td>
<td>3</td>
<td>0.39</td>
<td>2</td>
<td>0.26</td>
<td>3</td>
<td>0.39</td>
</tr>
<tr>
<td>Portable</td>
<td>0.04</td>
<td>4</td>
<td>0.16</td>
<td>3</td>
<td>0.12</td>
<td>2</td>
<td>0.08</td>
<td>3</td>
<td>0.12</td>
</tr>
<tr>
<td>Ergonomic</td>
<td>0.05</td>
<td>3</td>
<td>0.15</td>
<td>3</td>
<td>0.15</td>
<td>3</td>
<td>0.15</td>
<td>3</td>
<td>0.15</td>
</tr>
<tr>
<td>Total Score</td>
<td></td>
<td>3.08</td>
<td>3.03</td>
<td>2.87</td>
<td>2.86</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rank</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continue</td>
<td>Yes- Prim. Dsgn</td>
<td>Yes - Alt. Dsgn</td>
<td>No</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Relative Performance</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Much worse than reference</td>
<td>1</td>
</tr>
<tr>
<td>Worse than reference</td>
<td>2</td>
</tr>
<tr>
<td>Same as reference</td>
<td>3</td>
</tr>
<tr>
<td>Better than reference</td>
<td>4</td>
</tr>
<tr>
<td>Much better than reference</td>
<td>5</td>
</tr>
</tbody>
</table>

*See section 6 for details.

**6.0 Safety analysis**

Conduct a safety analysis, if appropriate, of the concepts being considered for selection. Use Table 5 for analysis. Rate using Hazard Analysis Scale. When evaluating and comparing concepts, prioritize based on highest total score for each hazard, i.e., what are the worst hazards for each concept and how do they compare. Describe which concept is best based on the evaluation. Rank each concept from 1-5 based on which is more safe (5 is most safe) and use in Table 4 in section 5.2.
If significant safety issues surface during this analysis, a concept may be eliminated for consideration.

**Table 5: Hazard analysis for each concept**

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Factors contributing to hazard</th>
<th>Effect/Injury Potential</th>
<th>Quantification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Example:</strong></td>
<td></td>
<td>Expo.</td>
<td>Like.</td>
</tr>
<tr>
<td>Fire &amp; Explosion</td>
<td>Gas line may wear through, spilling fuel. Potential ignition source</td>
<td>1st &amp; 2nd degree burns</td>
<td>Cons.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td>1-9</td>
<td>1-9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Multiply</td>
</tr>
</tbody>
</table>

**7.0 Special Topics**

**7.1 Budget and Vendor Purchase Information**

Provide a description of your budget, if applicable, and how these project funds will be spent. This budget will be updated in each report as more information is known up to the final report where all funds are known. The Final Report will not contain any estimates, as all the information should be completed. Major categories are travel, equipment, supplies, and poster. The Bill of Materials (BOM) should be included in the appendix, if applicable.

If your project does not require you to make purchases, you can simplify this section to Budget Information and include details relevant to the economic analysis you will complete in BE 466W. For example, if you will be generating a cost estimate on a channel design, you could include information here on what costs will be included and what sources will be used.

**7.2 Project Management**

Discuss project management approach and team capabilities. List your resumes in the Appendix. Include a deliverables agreement in the Appendix. Summarize how, with your management and technical skills, you will fulfil the project objectives. Provide a brief paragraph of major work that has to be completed before the end of the project (for proposal and DSR only).

**7.3 Risk Plan**

Discuss how your team will ameliorate or lessen any safety problems, if applicable. Risk factors can be marketing risk, technical risks, manufacturing risks, schedule risks or reliability risks but all are generally reducible to financial risk to the company or to the community. Provide a paragraph that identifies the critical path and one that also describes the risk plan table. See example of Risk Plan Table 6.
### Table 6. Risk Plan example

<table>
<thead>
<tr>
<th>Risk</th>
<th>Level</th>
<th>Actions to Minimize</th>
<th>Fall Back Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in customer specification</td>
<td>Moderate</td>
<td>- Involve customer in process of refining specifications</td>
<td>- Add time to schedule for that particular task</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Work with customer to estimate time and cost penalties of changes</td>
<td>- Additional budget required</td>
</tr>
<tr>
<td>Schedule delays</td>
<td>High</td>
<td>- Constantly track project progress</td>
<td>- Build in safety time</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Look for ways to accelerate activities</td>
<td>- Re-allocate resources or staff</td>
</tr>
<tr>
<td>Delays in order placement or delivery</td>
<td>Moderate</td>
<td>- Make sure parts are in stock</td>
<td>- Build it yourself</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Make sure purchasing department has all needed information</td>
<td>- Drive to NJ and pick it up</td>
</tr>
<tr>
<td>Product does not function as predicted</td>
<td>Low</td>
<td>- Test early and often</td>
<td>- Alternative design</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Be aware of risks of new technology</td>
<td>- Different material, technology, etc</td>
</tr>
<tr>
<td>Customer not satisfied</td>
<td>Moderate</td>
<td>- Understand the customer’s needs (voiced and non-voiced)</td>
<td>- Discuss ways to fix the problem</td>
</tr>
</tbody>
</table>

### 7.4 Ethics Statement

Provide a paragraph of how your team will abide by established ethical standards. This can be in this section or in the Appendix.

### 7.5 Environmental Statement

Provide a paragraph of how your team will meet or exceed environmental standards. This can be in this section or in the Appendix.

### 7.6 Communication and Coordination with Sponsor

Specify the interaction with your sponsor. Provide a listing of the schedule and the form of communication whether it is visits or conference calls.

### 7.7. Timeline

Develop a timeline with milestones for your project work. Include a Gantt chart with milestones, tasks and responsibilities as well as a short paragraph introducing the Gantt chart. Show enough detail to be meaningful and aid your team in making continued progress.

**NOTE: End of Proposal, completed in BE 460**
8.0 Detailed Design

The subsections below are outlined for a project that involves developing a design, prototyping (building), and testing. However, your project may require you to create a conceptual design but not build a physical prototype. For example, your project may require you to complete an analysis of multiple conceptual design alternatives in which case you may decide to have one subsection for each design. The subsections in 8.0 and 9.0 can be adjusted and re-ordered for your specific project but you must cover the following topics: engineering analyses completed for your design(s) (e.g., the detailed analyses completed to determine dimensions of open channel), description of the selection and/or optimization process for materials and/or components, procedure developed to test design (testing can be simulation-based!), discussion of test results, detailed design drawings and/or schematics, and economic analysis.

8.1 Detailed Analysis

What theoretical analyses were necessary to prove your design? Provide results of any calculations or computer simulations that you did. If you perform a Finite Element Analysis ensure that you also have done a hand calculation to verify the order of magnitude results or experimental results. Did you have to make an initial prototype to prove an unknown concept or assembly method? If so, describe what you did. Summarize the results with reference to the output data in the Appendix.

8.2 Material and Component Selection

What materials or software were chosen for the major parts of the prototype or design? If applicable, what components were chosen for the major parts of the prototype or design?

8.3 Selection Process and Design Optimization

Describe the process you went through for picking the materials for the prototype or design, i.e., what tradeoffs (availability, cost, strength, flexibility, machinability, weldability, green material, recyclability, etc.) were the driving factors. Describe the process you went through for picking the components for the prototype, i.e., what tradeoffs (availability, cost, ergonomics, features, speed, size, green material, etc.) were the driving factors. If applicable, explain a quantitative optimization analysis performed to select a material or size a component in your design.

8.4 Drawings

Provide detailed professional drawings that quantify your detailed design. For example, CAD drawings could be used for a mechanical part. The vast majority of the details and shop drawings should be placed in the appendix. The drawings should be appropriately noted to be viewed in the appendix. All assemblies and parts drawings should be included. These drawings should be modified in the Final Report if during the assembly or machining phase there was a need for revision.

8.5 Test Procedure

Describe your experimental or simulated test procedures. Be specific on how you intend to evaluate/test your solution. This should be a well thought-out procedure with details on how you will test the parts or design for meeting the customer's needs. This is not just a basic statement stating that the parts will be tested to meet some customer requirements, but a list of detailed steps of what you will be doing and what equipment you will be using.
If you are working on a conceptual design project, your test procedure will most likely involve simulation using software (e.g., HEC-RAS, SuperPro Designer). For a natural resources project, your test procedure might also include an exceedance analysis. For example, if you designed your stormwater BMP for a 25-yr storm, look at how it would perform under a 50- and 100-yr storm. What percentage of the storm (in terms of peak flowrate and volume) will bypass the BMP?

NOTE: End of Design Specifications Report (DSR)
9.0 Final Discussion

9.1 Implementation Processes

Provide enough implementation or construction detail such that a person could reproduce the design from your description and pictures. Pictures during the construction process are very informative. A few pictures can be inserted here but most should be in the Appendix. Again, if any improvements were made or if any drawings changed from the earlier detailed design report then replace old drawings with new drawings.

If your project involves a conceptual system design, you might use this section of the report to describe how the system would be implemented in practice. For example, the design may be implemented in phases. If you are proposing to incorporate an open channel into a landscape, this would be implemented through a cut/fill process. Remember that you can re-order (and/or re-name) report subheadings so sections 8.0 and 9.0 fit well with your specific project!

9.2 Test Results and Discussion

This is a discussion on how well your design faired during the testing phase. Answer the question of whether or not it passed your expectations as well as meeting the customer's needs and specifications. Summarize your data with the major results here. Include all of your data in the Appendix.

10.0 Economic analysis

An economic analysis should be performed demonstrating the value of your design. For example, you may perform a net present value (NPV) analysis for a product or system you developed. State all assumptions. Include analysis as shown in Table 7. In some cases, you may not be able to obtain accurate information, in which case you can provide your best estimate.

For projects where you are designing a product that could be manufactured, your NPV analysis might include development, ramp-up, marketing and support, and production and sales. Development should include any capital (facilities and equipment), purchased services, salaries (with overhead), materials and supplies. Ramp up costs should include additional capital (facilities and equipment), tooling, additional salaries (with overhead) and training. Marketing and support should include purchased services (including advertising), additional salaries (with overhead), legal, and warranty/repair costs. Production and sales should include purchased materials, supplies, and services, additional salaries (with overhead), sales support, training, facilities (including energy), shipping, etc. You may want to add additional topics based on your specific project.

For projects where you are designing a system to be built in a community, your NPV analysis might include capital investment (engineer's cost estimate - labor, materials, site preparation, excavation, etc.) and maintenance. You may want to add additional topics based on your specific project.

Based on this analysis, provide a brief discussion on whether your product or system would be a good investment, and what factors most impact profitability. Or as appropriate, provide a brief discussion about how your final design economics compare to a benchmark or to alternative designs. In some cases, the NPV will be negative which is the nature of some projects.
Table 7. NPV analysis chart.

<table>
<thead>
<tr>
<th>NPV analysis</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Q 1</td>
<td>Q 2</td>
<td>Q 3</td>
<td>Q 4</td>
</tr>
<tr>
<td>Development</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ramp-up</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marketing and support</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production and sales</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Period cash flow</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NPV</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: provide a discussion on what discount rate you decide to use.

11.0 Conclusions and Recommendations

Add concluding thoughts that summarize your project, tying your final design back to the customer needs and specifications. This should show the process from beginning to end and finish with recommendations of what would be done to improve the next version of this project. In the appendix, rate your team in two (2) areas on a scale from 1-10 in each category, where 10 is meeting all needs in Design Criteria Satisfaction. This is twofold; you must rate yourself on meeting the customer’s needs as well as the impact of your engineering solutions on global and societal needs. First, rate yourself on meeting the customer's needs and then generally write a short paragraph how your design met those needs. Second, rate yourself on global and societal needs which your team’s solutions have met and to what level. Write an accompanying paragraph about some specific decisions you made during the project and how the global and societal needs were met. These global and societal needs may involve safety, environment, sustainability, bioethics or basic human needs.
References (Times New Roman, 14, Bold)

Note: That for the author-date system, references are listed in alphabetical order.


Appendix: (listed in sections A, B, C, D....)

SolidWorks working drawings and a BOM of the final design should be placed in an appendix. Additional paragraphs concerning resumes, established communication dates with sponsor, calculations, patent search details, ethics and environmental statements may also be included here. If other items are too bulky, the vast majority of these tables, graphs, other should be listed here. Note these items should be listed in the proper paragraphs and then referenced to see details in the appendix, page ___.

NOTE: End of Final Report
Additional information:

For section 6.0 Safety Analysis, use the following Hazard Analysis Scale:

<table>
<thead>
<tr>
<th>Exposure</th>
<th>Likelihood</th>
<th>Consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rating</td>
<td>Rating</td>
</tr>
<tr>
<td></td>
<td>Descriptor</td>
<td>Descriptor</td>
</tr>
<tr>
<td>Rating</td>
<td>Descriptor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Continuous</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Almost</td>
</tr>
<tr>
<td></td>
<td></td>
<td>happen</td>
</tr>
<tr>
<td></td>
<td></td>
<td>certain</td>
</tr>
<tr>
<td></td>
<td></td>
<td>to happen</td>
</tr>
<tr>
<td>7</td>
<td>Once daily</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Very possible but not</td>
</tr>
<tr>
<td></td>
<td></td>
<td>assured</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Once per use per season or annually</td>
<td>5</td>
</tr>
<tr>
<td>---</td>
<td>-----------------------------------</td>
<td>---</td>
</tr>
<tr>
<td>3</td>
<td>Once in life of product</td>
<td>3</td>
</tr>
<tr>
<td>1</td>
<td>Theoretically possible but highly unlikely</td>
<td>1</td>
</tr>
</tbody>
</table>
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>JEFFREY CATCHMARK</td>
<td>jmc102</td>
<td>Agricultural Sciences (AG)</td>
<td>Not Available</td>
</tr>
<tr>
<td>MEGAN MARSHALL</td>
<td>MNM11</td>
<td>Agricultural Sciences (AG)</td>
<td>Not Available</td>
</tr>
</tbody>
</table>

College with curricular responsibility: Engineering (EN)

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

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

Course Designation

(BE 466) Biological Engineering Design II

Course Information

Cross-Listed Courses:

Prerequisites:
BE 460

Corequisites:

Concurrents:

Recommended Preparations:

Abbreviated Title: Biol Eng Dsgn II

Discipline:

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
[X] Writing Across the Curriculum

First-Year Engagement Program
Course Outline

A brief outline or overview of the course content:
BE 466 is the second in a two-course sequence where Biological Engineering (BE) students complete a capstone design project. The focus of BE 466 is on detailed design, documentation, and presentation. BE 466 is a writing-intensive course that is required for all BE students.

A listing of the major topics to be covered with an approximate length of time allotted for their discussion:
Class focuses on hands-on laboratory activities that facilitate development of design specifications, generation of design alternatives, development of detailed design, design implementation, and design testing by student teams. In addition to laboratory activities, students draft and revise various documents relevant to the engineering discipline, including project proposal, progress reports, and technical design report. Student teams also complete design notebooks and evaluations to document their design process and team dynamics. Student teams meet weekly with course instructor and communicate weekly with project sponsor. The course is scheduled with two 2-hour meeting periods per week.

A general schedule for the semester is as follows:
Week 1 – Project proposal review, recap of deliverables/schedule
Weeks 2-4 – Refinement of design specifications
Weeks 5-9 – Development and analysis of design alternatives and associated report
Week 10 – Poster presentations on progress (coordinated with visit from industry advisory board, schedule permitting)
Weeks 11-14 – Final work on detailed design and associated report, design testing
Week 15 – Final design presentations

Course Description:
BE 466 is part two of a two course sequence that provides a culminating design experience for students in the Biological Engineering major. Students will develop skills and techniques for managing and executing engineering design projects in the following fields: agricultural engineering, food and biological processing engineering, and/or natural resource engineering. Projects are sponsored by faculty, industry, or community initiatives and are structured to span two semesters. In the Fall semester, the emphasis is on classroom lectures, preliminary analyses, and project proposal development. In the Spring semester, the emphasis is on hands-on laboratory activities, project execution, and report preparation. Project teams perform all facets of the design process. This includes problem identification, planning of the project, formulation of design specifications, development and evaluation of alternative conceptual designs, development of detailed designs, consideration of safety and design optimization, design implementation, design testing, and analysis and documentation of results. Students improve their writing skills through preparation and refinement of various documents including a design notebook, proposal, statement of work, design specification report, status reports, and a final report. Students also present their results in other formats, including poster and oral presentations for both technical and non-technical audiences.

The name(s) of the faculty member(s) responsible for the development of the course:
Name: JEFFREY CATCHMARK (jmc102)
Title: PROF AG & BIO ENG
Phone: +1 814 863 0414
Address: 0248 AG ENGR BLDG
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.

Upon completing this course, students should be able to:
• Interact with a customer (supervisor, co-worker, client) to formulate equitable design criteria (cost, time, specifications) for a meaningful engineering project
• Develop an action plan to complete the project on time and within budget
• Conceptualize systems to satisfy design criteria
• Analyze technical and economic merits of design alternatives
• Work effectively in a team that includes co-workers and customers
• Communicate well using verbal, written, and electronic methods
• Develop and improve writing skills
• Prepare engineering documents, including project proposal, progress report, and final design report
• Demonstrate professionalism in interactions with colleagues, faculty, and staff
• Demonstrate an appreciation of economic, global, societal, and ethical issues
• Demonstrate a knowledge of contemporary issues

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.

Writing assignments are indicated by a * below and make up ~50% of the final grade. Final grade will be based on:
Peer and self evaluations: 15%
Sponsor evaluation: 10%
*Design specifications report: 15%
*Final report: 25%
IPAC poster presentation: 10%
Final presentation: 10%
*Update memos and electronic notebook: 10%
Participation/professionalism: 5%

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.
Together, BE 460 (Biological Engineering Design I) and BE 466 (Biological Engineering Design II) make up the culminating design experience for senior BE students. BE 460 serves as the prerequisite for BE 466, the second course in the two-course sequence. In BE 460, students develop their design project proposals while in BE 466, students refine the design specifications, implement their proposal, and document the final results.

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 460 (BE Design I) and BE 466 (BE Design II) are both required for BE students. Together, the two courses satisfy the writing across the curriculum requirement and the capstone design experience for BE students.

A description of any special facilities:
The Agricultural and Biological Engineering Department houses a fabrication shop and computer lab to support simulation and prototyping for the design projects.

Frequency of Offering and Enrollment:
The course will be offered every spring semester. Expected enrollment is approximately 25 students per section with 2 sections to accommodate ~50 BE seniors.

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.
BE 460 is currently a one-credit course and BE 466 is currently a three-credit course. The total content of the four-credit course sequence is not changing; however, the following changes are proposed:

1. Change BE 460 to a writing-intensive course -- The focus of BE 460 is development of the design project proposal. Throughout the semester, the student teams submit drafts, receive instructor feedback, and revise until the final proposal is submitted at the end of the semester. Students also write a team agreement, send update memos to project sponsors, and maintain a design notebook.

2. Change BE 460 from a one-credit to a two-credit course -- The BE 460/466 course sequence is currently in its second offering. Based on the observations of the instructors and feedback from students, it was determined that the workload in BE 460 was equivalent to two credits (based on the recommended guideline of ~45 hours/credit). BE 460 involves formal lectures, team meetings with the instructors, plus time outside of class to meet with project sponsor, work on project proposal, and complete preliminary analyses for project.

3. Change BE 466 from a three-credit to a two-credit course -- This proposed change is again based on instructor observation and student feedback in the previous offerings of the BE 460/466 course sequence. By spending extra time in BE 460 building a relationship with the project sponsor and completing preliminary design calculations, less time is spent in BE 466 refining the design specifications and completing the final design.

BE 460 and BE 466 are only required for BE students and are only taken by BE students. Therefore, no external consultation was requested on these course change proposals. The proposals were approved by the ABE Undergraduate Studies Committee and by the ABE Faculty (as indicated by formal consultation with ABE department head).

Writing Across the Curriculum (W,M,X,Y course suffixes)

A copy of the course syllabus:

BE 466 Biological Engineering Design II Syllabus Supervisors: Jeffrey Catchmark Megan Marshall Time/Location: TBD Course Description: BE 466 is the second of a 2-semester capstone design experience. Through this experience, students develop skills and techniques for managing and executing engineering design projects. These skills are applied to a project sponsored by faculty, industry or other organizations. Project teams engage in all facets of the design process. This includes problem identification and clarification, planning of the project, formulation of design specifications, development and evaluation of conceptual designs, development of detailed designs, implementing the design, and analysis and documentation of results. The preparation and refinement of various documents including notebook entries, status reports, a design specification report, and a final report will allow students to improve their writing skills. Students may also travel to sponsor sites, when possible, to gain an understanding of existing processes and problems and to assess the sponsor's needs. Course Objectives: Upon completing this course, students should be able to: 1. Interact with (co-worker, client) to formulate equitable design criteria (time, cost, specifications) for a meaningful engineering project 02. Develop an action plan to complete the project on time and within budget 03. Conceptualize systems to satisfy design criteria 04. Analyze technical and economic merits of design alternatives 05. Work effectively in a team that includes co-workers, customers and vendors 06. Communicate well using verbal, written and electronic methods 07. Develop and improve writing skills 08. Demonstrate professionalism in interactions with colleagues, faculty, and staff 09. Demonstrate an appreciation of economic, global, societal, and ethical issues 10. Demonstrate knowledge of contemporary issues Pre-requisite: BE 460. Grading Table: Final grade will be based on: Peer evaluations: 15% Sponsor evaluation: 10% DSR report: 15% Final report: 25% IPAC poster presentation: 10% Final presentation: 10% Update memos and electronic notebook: 10% Participation/professionalism: 5% Grading Scale: A > 94% 82% ≤ B < 86% 70% ≤ C < 74% 90% ≤ A > 94% 78% ≤ B < 82% 60% ≤ D < 70% 86% ≤ B+ < 90% 74% ≤ C+ < 78% F < 60% Course Policies: - Academic Integrity: Students are expected to abide by the College of Engineering’s Academic Integrity policy, http://www.engr.psu.edu/faculty-staff/academic-integrity.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. 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 time/date specified as shown in the schedule. 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 the instructor’s attention within one week after the graded material was handed back. Scores will not be reconsidered after this time period has elapsed. - Participation: Participation is expected during each class. As a professional courtesy, please inform the instructor prior to any anticipated legitimate class absences. Also see the Faculty Senate Policy on Class Attendance (42-27). - Cell Phones: Turn cell phones off upon entering classroom. Additional Course Requirements: - Project Notebook: Each team is responsible for organizing and maintaining an electronic project notebook throughout the semester. The notebook should be managed using Google Drive. The notebook should contain drawings, concepts, ideas, & anything discussed regarding the project (for example, hand drawings can be imbedded in the notebook as scans or photos). The journal is a working document so neatness is not important, though it be readable and dated. The notebook will be reviewed periodically by instructors. - Progress Reports: Each team must submit a weekly progress/status report including an updated schedule to both the project sponsor and instructor. While the progress report represents the entire team’s efforts, final preparation and submission of the progress report will be a rotating responsibility among team members. Be aware that minor delays in the beginning cause major problems at the end. - Labor Division: Groups will prepare a document showing division of labor and ground rules. This will be documented. Again, teamwork is essential in this class. - DSR and FINAL reports: The Design Specification Report (DSR) and Final Report are major deliverables in BE 466. See Angel site for template, details and evaluation rubric. - Oral Presentations: Will be evaluated based on preparation, visual aids, stage presence, and overall effectiveness. All team members should have a role and present a portion of the presentation. Time allotted may vary depending upon groupings and number of groups. See Angel site for template, details and evaluation rubric. - Self and Peer Assessment: Periodically throughout the course you will have the opportunity to assess your own performance, and your performance will be assessed by your peers. Peers will have the opportunity to assess your level of involvement, effort and productivity. See Peer evaluation form on Angel. This is an important component of your overall evaluation and worth 15% of your final grade. - Professionalism: You should conduct yourself with high professional standards and have an ethical and positive social interaction with the sponsor, team members, staff and instructors. - Safety: Any use of department facilities requires the appropriate safety training. Your instructor will review this safety training at the start of the semester. Writing across the curriculum: This course satisfies the writing across the curriculum graduation requirement, and as indicated above, includes several writing assignments. There are assignments that are designed to help you learn to write in your discipline. These include the progress reports, design specifications report, and final report. There are also assignments where you will write to learn about your design process or your team dynamics, such as the project notebook and
In BE 466, writing is a developmental process. You start with your project proposal from BE 460; throughout the semester, you will receive feedback, document ideas in your project notebook, refine your design, and edit your writing until you complete the final design report. Instructor, sponsor and student roles: The instructor is there to assist you in locating information and act as a coach or consultant on technical issues, but will not make design decisions for you. The design problems specified by your sponsor are just the start of the design process. It is the responsibility of the students and their team to further define the problem through effective interactions with their sponsor. Excellent student teamwork and communications are essential in this class! Course Deliverables: The following is expected at the conclusion of this course: - Copy of Final Report in both doc and pdf formats. - Copy of Final Presentation in ppt format. - Copy of Poster in ppt format. - Electronic course notebook. Important Dates/ Major Milestones: - Design Specifications Report (DSR) due – TBD - IPAC poster session – TBD - Final presentations – TBD - Sustainable Communities Collaborative (SCC) closing event – TBD - Final Report due – TBD

2. A concise explanation of how the proposed course will fulfill each of the following criteria:

(a) 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 characteristically designed 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.

Writing assignments will be designed to balance learn to write and write to learn objectives. “Learn to write” assignments include the formal design specifications report, final design report, and weekly status reports, where student teams learn to prepare technical design and progress reports for the engineering discipline. Formal writing assignments such as these will be accompanied by a template and a rubric, so the expectations are clear (see more details under section 2d).

An example of a “write to learn” assignment is the electronic design notebook that the student teams will maintain. The design notebook will serve as one location where student teams can track resources as they find them, document key outcomes and action items from meetings, brainstorm ideas, and more. The design notebook will be informal but an important component of the design process.

(b) 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 information 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. Written reports will develop and evolve throughout the semester, given the nature of the capstone design project. Student teams begin BE 466 with a project proposal developed in BE 460 and proposal feedback from instructor and project sponsor. Teams will build on this proposal and feedback to refine the design specifications report. After instructor, sponsor, and peer feedback on this report, teams produce a final design report. Throughout the semester, students will be writing, editing, and rewriting. Students will also be maintaining a design notebook throughout the semester. This will be less formal but will assist teams in tracking important project information and resources to support report preparation.

(c) 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 will 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. At the start of BE 460, each project team creates a folder in Google Drive to share with all team members and instructors. The design notebook and all writing assignments are kept in this folder for both BE 460 and BE 466. For writing assignments, teams receive feedback in the form of instructor comments in the document and rubric scores/comments. There will also be the opportunity to discuss and review writing assignment feedback in the weekly team meetings with the instructor. In addition to instructor feedback, student teams will also receive feedback from sponsors on key writing assignments, such as the project proposal and design specifications report. Since the reports build throughout the semester, this feedback will be incorporated in the next submission.

(d) 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.

Prior to the start of a writing assignment, students will be provided with a sample and/or template, as well as a detailed grading rubric. For example, students will receive templates and samples for the design specifications report and final design report. The rubric contains the following categories: technical content, style/audience (professional vocabulary/style, written for specified audience), structure (organization, formatting/incorporation of tables/figures), clarity (easy to read, uniform writing style), mechanics (spelling, punctuation, grammar). As indicated in the course change proposal, various writing assignments make up about 50% of each student’s final grade.

One or two examples of the actual writing assignment sheets the instructor plans to use in the course.
Template for team technical report is provided below (all tables/figures have been removed for easier viewing). The sections make up the project proposal, design specifications report, and final design report. The project proposal is drafted in BE 460, but will be refined in BE 466.

Show Team name and Report name

Date

Show picture of topic on front page

Signature % effort on report (total 100%)

First Author ___________________ %
Second Author ___________________ %
Third Author ___________________ %
Fourth Author ___________________ %
Fifth Author ___________________ %

NOTE: The proposal (pages 1-8 of this template) is completed in BE 460. The proposal is the starting point in BE 466. Also, when preparing your proposal (BE 460), design specifications report - DSR (BE 466W) or final report (BE 466) please do not include the instructional text below. You are to submit a polished report with your own writing.

Executive Summary
The report should start with an Executive Summary (or also known as an Abstract) of approximately 200-400 words, summarizing the objective, contents, results, and conclusions as specifically as possible. The heading of the Executive Summary should be italic. This MUST be updated for subsequent reports with previous report data updated also. This essentially encompasses all of what an executive may read, so summarize what the major results are in this report in this paragraph.

Table of Contents
List paragraph numbers and indented subparagraph numbers and topic names in a column. Also list the appropriate page numbers of the paragraphs on the right side of the page.

1.0 Introduction
The entire body text of the report should be Times New Roman, 12, and justified. Major headings should be numbered consecutively, 1.0, 2.0, 3.0, etc., typed in bold face with a font size of 16. Sub-headings should be numbered consecutively, 1.1, 1.2, etc., typed in bold face with a font size of 14. Finally, sub-sub-headings should also be numbered consecutively, 1.1.1, 1.1.2, etc., typed in bold face with a size 12 font face. It is not recommended to go beyond three levels of headings.
Tense should be appropriate for the section and stage of the report. For example, the proposal may have content which describes what ‘will’ be done rather than what ‘has’ been done. The final report will not have any future tense except for future work.
Use the introduction section to provide some background information on your project. This introductory information should come from your literature search – Library, Internet, trade magazines, etc. All sources that are not your own ideas should be referenced.
For your reports, please use the parenthetical references: author-date system (Ogot and Kremer, 2004, pg.71). A sample reference list addressing each of the five main types of information sources is given at the end. These include: websites (Swanson, 1999), journals (Muriru and Daewoo, 2002), books (Zacharia and Daudi, 2001), conference proceedings (Peters et al., 2001) and patents (Wen-Cheng, 1994).
Finally, make sure that your report has page numbers from the second page through the appendix. This is often forgotten. Correct presentation is essential, so turn in a professional report!

1.1 Initial Problem Statement
Provide a brief paragraph describing your initial problem statement and the importance of the problem. Provide background information to educate the reader. Most of this should come from the problem statement that you received from your sponsor.
Supply a brief description of the sponsor, if applicable.

1.2 Objectives
Provide in paragraph form a general explanation of what you expect your design will and will not show. This section contains the scope of work and limitations of your future design. (This is a difficult paragraph to write, but ensures that you are thinking clearly on general objectives and how you intend to address them.)

2.0 Sponsor Needs Assessment

2.1 Gathering Input
This section will describe the manner in which you gathered information from your sponsor or associated sources. Remember, engineering design projects require quantification! Specifications like “the system needs to be fast, efficient, light, cheap, robust, and simple” are merely starting points but by themselves useless in design. You want to get as much quantitative information from your sponsor as possible and identify what you don't know and must quantify. Your sponsor may not have every answer, which will require your team to develop these specifications. Quantification is critical! It is a foundation of engineering.

2.2 Weighting of Customer Needs
To create a weighted hierarchal customer needs list use a pairwise comparison chart as shown in Table 1. You first have to develop a list of customer needs based on your interactions with your sponsor and your own insights (e.g., has your sponsor missed anything which needs to be discussed?). Note, the needs listed in Table 1 are just examples. Yours may be much different. In this section you should detail how you developed a weighting for the customer needs. For example, for the case in Table 1 you would have to detail why would ease of use be less important (1.00) than ease of manufacturing (3.00). The greatest value of the pairwise comparison chart is the discussion it generates amongst team members as you try to assess what needs are most important (the same is true for many of the tables in the proposal) – do not assign this table to one team member to complete, rather work on it as a team!
3.0 External Search

There are many sources of information that your team can use to educate yourselves and advance your project. You will have to do some independent learning to make your project successful. This is standard practice in any job, i.e., your university degree is the start of your education, not the end. Sources include journal articles, patents, books, written application notes, written industry standards, industry codes, product catalogues, and web resources. You should perform a literature search to obtain relevant information for your project. For example, patents contain a wealth of very specific information on devices and processes that can guide product or process development. Product catalogues often contain technical information on how products work, and can show you existing/competing products whose performance may need to be benchmarked against your specifications. Industry standards can detail important measurement procedures. Obtaining background information is essential for efficient execution of a design project. There is no benefit derived from spending time and resources ‘reinventing the wheel’.

You should perform a literature search that is relevant to your specific project. Your report should include each section below where some options exist to customize your report based on your project type. For example, teams working on devices should certainly conduct a patent search. However, teams working on a natural resources project may benefit from searching industry standards or application notes. Use your best judgement but don’t exclude something just to shorten the task. The more effort you invest into this section, the easier your project will be.

3.1 Journal Articles (3 minimum)
Focus on peer-reviewed or professional journals.

3.2 Patents and/or industry standards/application notes (3 minimum)
Detail why the patent or other resource was important, i.e., what you learned and how you can apply it to your project.

3.3 Existing Products or Design Approaches (3 minimum)
Provide informative data as to what is on the market today or provide examples of what design approaches you have discovered and why they are important to your project.

3.4 Other sources (3 minimum)
These could be product catalogues, web sites, blogs, etc.

4.0 Engineering Specifications

4.1 Establishing Target Specifications and Specification Analysis
Provide a table (Table 2) of an initial set of target values that you established as a starting point for the project. Remember these are numbers with units. A specification is not “the design will be lightweight”. That is a qualitative description. A specification would be “the weight of the final unit is between 30 lbs and 55 lbs, or, more optimally, between 30 lbs and 40 lbs.” The limits of range could be values which cannot be exceeded. Provide a description of how and why you chose these values and how they relate to the customer’s needs.

Establishing specifications may also require an engineering analysis. For example, if a maximum flow rate needs to be specified, you may have to perform some fluid dynamics calculations to develop that specification. Such engineering analyses are expected in this report. You should include any engineering analysis used to develop your target specifications.

4.2 Relating Specifications to Customer Needs
Show a Needs-Metrics Matrix in a QFD that has customer needs, specifications and values as detailed in class. An example is provided below in Table 3.

5.0 Concept Generation and Selection

5.1 Concept Generation
Generate at least 3 concepts, but you may want to generate more. In the body of this section explain the concept. The figures should be neat and if mechanical, SolidWorks solid models are preferred. Note: many products available from, for example, McMaster Carr come with SolidWorks and other CAD models. You often do not have to create these!

5.1.1 Concept 1: concept name

5.1.2 Concept 2: concept name

5.1.3 Concept 3: concept name

5.2 Concept Selection and Analysis
Provide a Concept Scoring Chart as shown in Table 4 evaluating each of your concepts. This chart is used to help your team both develop (by collectively analysing the concepts, leading to new concepts) and select the best concept. Discuss how concepts can potentially be combined to develop an improved concept meeting your customer’s needs. A discussion of pros and cons of each design is required. Note that your selection criteria may be quite different than the examples shown in Table 4, but should match those that you developed for Table 1.

When developing and combining concepts, more detailed engineering analyses are typically required. For example, if power efficiency is a selection criterion, and your system requires a heat exchanger, a thermodynamic analysis may be required to select the best concept. Or if weight of a device is an issue, a structural analysis may be required to determine the best design requiring the least material. Such engineering analyses are expected in this report. You should include any engineering analysis used to develop and select your concepts.
6.0 Safety analysis
Conduct a safety analysis, if appropriate, of the concepts being considered for selection. Use Table 5 for analysis. Rate using Hazard Analysis Scale. When evaluating and comparing concepts, prioritize based on highest total score for each hazard, i.e., what are the worst hazards for each concept and how do they compare. Describe which concept is best based on the evaluation. Rank each concept from 1-5 based on which is more safe (5 is most safe) and use in Table 4 in section 5.2. If significant safety issues surface during this analysis, a concept may be eliminated for consideration.

7.0 Special Topics
7.1 Budget and Vendor Purchase Information
Provide a description of your budget, if applicable, and how these project funds will be spent. This budget will be updated in each report as more information is known up to the final report where all funds are known. The Final Report will not contain any estimates, as all the information should be completed. Major categories are travel, equipment, supplies, and poster. The Bill of Materials (BOM) should be included in the appendix, if applicable.
If your project does not require you to make purchases, you can simplify this section to Budget Information and include details relevant to the economic analysis you will complete in BE 466W. For example, if you will be generating a cost estimate on a channel design, you could include information here on what costs will be included and what sources will be used.

7.2 Project Management
Discuss project management approach and team capabilities. List your resumes in the Appendix. Include a deliverables agreement in the Appendix. Summarize how, with your management and technical skills, you will fulfill the project objectives. Provide a brief paragraph of major work that has to be completed before the end of the project (for proposal and DSR only).

7.3 Risk Plan
Discuss how your team will ameliorate or lessen any safety problems, if applicable. Risk factors can be marketing risk, technical risks, manufacturing risks, schedule risks or reliability risks but all are generally reducible to financial risk to the company or to the community. Provide a paragraph that identifies the critical path and one that also describes the risk plan table. See example of Risk Plan Table 6.

7.4 Ethics Statement
Provide a paragraph of how your team will abide by established ethical standards. This can be in this section or in the Appendix.

7.5 Environmental Statement
Provide a paragraph of how your team will meet or exceed environmental standards. This can be in this section or in the Appendix.

7.6 Communication and Coordination with Sponsor
Specify the interaction with your sponsor. Provide a listing of the schedule and the form of communication whether it is visits or conference calls.

1. Timeline
Develop a timeline with milestones for your project work. Include a Gantt chart with milestones, tasks and responsibilities as well as a short paragraph introducing the Gantt chart. Show enough detail to be meaningful and aid your team in making continued progress.
NOTE: End of Proposal, completed in BE 460

8.0 Detailed Design
The subsections below are outlined for a project that involves developing a design, prototyping (building), and testing. However, your project may require you to create a conceptual design but not build a physical prototype. For example, your project may require you to complete an analysis of multiple conceptual design alternatives in which case you may decide to have one subsection for each design. The subsections in 8.0 and 9.0 can be adjusted and re-ordered for your specific project but you must cover the following topics: engineering analyses completed for your design(s) (e.g., the detailed analyses completed to determine dimensions of open channel), description of the selection and/or optimization process for materials and/or components, procedure developed to test design (testing can be simulation-based!), discussion of test results, detailed design drawings and/or schematics, and economic analysis.

8.1 Detailed Analysis
What theoretical analyses were necessary to prove your design? Provide results of any calculations or computer simulations that you did. If you perform a Finite Element Analysis ensure that you also have done a hand calculation to verify the order of magnitude results or experimental results. Did you have to make an initial prototype to prove an unknown concept or assembly method? If so, describe what you did. Summarize the results with reference to the output data in the Appendix.

8.2 Material and Component Selection
What materials or software were chosen for the major parts of the prototype or design? If applicable, what components were chosen for the major parts of the prototype or design?

8.3 Selection Process and Design Optimization
Describe the process you went through for picking the materials for the prototype or design, i.e., what tradeoffs (availability, cost, strength, flexibility, machinability, weldability, green material, recyclability, etc.) were the driving factors. Describe the process you went through for picking the components for the prototype, i.e., what tradeoffs (availability, cost, ergonomics, features, speed, size, green material, etc.) were the driving factors. If applicable, explain a quantitative optimization analysis performed to select a material or size a component in your design.

8.4 Drawings
Provide detailed professional drawings that quantify your detailed design. For example, CAD drawings could be used for a mechanical part. The vast majority of the details and shop drawings should be placed in the appendix. The drawings should be
8.5 Test Procedure
Describe your experimental or simulated test procedures. Be specific on how you intend to evaluate/test your solution. This should be a well thought-out procedure with details on how you will test the parts or design for meeting the customer’s needs. This is not just a basic statement stating that the parts will be tested to meet some customer requirements, but a list of detailed steps of what you will be doing and what equipment you will be using.

If you are working on a conceptual design project, your test procedure will most likely involve simulation using software (e.g., HEC-RAS, SuperPro Designer). For a natural resources project, your test procedure might also include an exceedance analysis. For example, if you designed your stormwater BMP for a 25-yr storm, look at how it would perform under a 50- and 100-yr storm: What percentage of the storm (in terms of peak flowrate and volume) will bypass the BMP?

NOTE: End of Design Specifications Report (DSR)

9.0 Final Discussion

9.1 Implementation Process
Provide enough implementation or construction detail such that a person could reproduce the design from your description and pictures. Pictures during the construction process are very informative. A few pictures can be inserted here but most should be in the Appendix. Again, if any improvements were made or if any drawings changed from the earlier detailed design report then replace old drawings with new drawings.

If your project involves a conceptual system design, you might use this section of the report to describe how the system would be implemented in practice. For example, the design may be implemented in phases. If you are proposing to incorporate an open channel into a landscape, this would be implemented through a cut/fill process. Remember that you can re-order (and/or re-name) report subheadings so sections 8.0 and 9.0 fit well with your specific project!

9.2 Test Results and Discussion
This is a discussion on how well your design faired during the testing phase. Answer the question of whether or not it passed your expectations as well as meeting the customer’s needs and specifications. Summarize your data with the major results here. Include all of your data in the Appendix.

10.0 Economic analysis
An economic analysis should be performed demonstrating the value of your design. For example, you may perform a net present value (NPV) analysis for a product or system you developed. State all assumptions. Include analysis as shown in Table 7. In some cases, you may not be able to obtain accurate information, in which case you can provide your best estimate.

For projects where you are designing a product that could be manufactured, your NPV analysis might include development, ramp-up, marketing and support, and production and sales. Development should include any capital (facilities and equipment), purchased services, salaries (with overhead), materials and supplies. Ramp up costs should include additional capital (facilities and equipment), tooling, additional salaries (with overhead) and training. Marketing and support should include purchased services (including advertising), additional salaries (with overhead), legal, and warranty/repair costs. Production and sales should include purchased materials, supplies, and services, additional salaries (with overhead), sales support, training, facilities (including energy), shipping, etc. You may want to add additional topics based on your specific project.

For projects where you are designing a system to be built in a community, your NPV analysis might include capital investment (engineer’s cost estimate - labor, materials, site preparation, excavation, etc.) and maintenance. You may want to add additional topics based on your specific project.

Based on this analysis, provide a brief discussion on whether your product or system would be a good investment, and what factors most impact profitability. Or as appropriate, provide a brief discussion about how your final design economics compare to a benchmark or to alternative designs. In some cases, the NPV will be negative which is the nature of some projects.

11.0 Conclusions and Recommendations
Add concluding thoughts that summarize your project, tying your final design back to the customer needs and specifications. This should show the process from beginning to end and finish with recommendations of what would be done to improve the next version of this project. In the appendix, rate your team in two (2) areas on a scale from 1-10 in each category, where 10 is meeting all needs in Design Criteria Satisfaction. This is twofold; you must rate yourself on meeting the customer’s needs as well as the impact of your engineering solutions on global and societal needs. First, rate yourself on meeting the customer needs and then generally write a short paragraph how your design met those needs. Second, rate yourself on global and societal needs which your team’s solutions have met and to what level. Write an accompanying paragraph about some specific decisions you made during the project and how the global and societal needs were met. These global and societal needs may involve safety, environment, sustainability, bioethics or basic human needs.

References (Times New Roman, 14, Bold)

Note: That for the author-date system, references are listed in alphabetical order.

Appendix: (listed in sections A, B, C, D,...)

SolidWorks working drawings and a BOM of the final design should be placed in an appendix. Additional paragraphs concerning resumes, established communication dates with sponsor, calculations, patent search details, ethics and environmental statements may also be included here. If other items are too bulky, the vast majority of these tables, graphs, other should be listed here. Note these items should be listed in the proper paragraphs and then referenced to see details in the appendix, page ___.

NOTE: End of Final Report

**Campuses That Have Offered (BE 466) Over The Past 4 Years**

| semester | AB | AL | BK | BR | BW | CR | DS | ER | FE | GA | GV | HB | HN | HY | LV | MA | NK | PC | SL | SL | UP | WB | WC | WS | XC | XP | XS | YK |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Spring   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 2017     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |

**Review History**

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

Legend

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

**Consultation**

- **Recipient Name:** PAUL HEINEMANN
- **Department:** Agricultural And Biological Engineering
- **Position:** Consultation
- **Title:** DEPT HD/PROF AG & BIO ENG

(1) **Request sent:** 12/22/2016 at 3:06 PM
- **Concur:** Yes
- **Comments:**
- **Reviewed On:** 12/22/2016 at 3:08 PM

**Head of Department**

- **Recipient Name:** PAUL HEINEMANN
- **Department:** (Not Available)
- **Position:** Head of Department
- **Campus:** UNIVERSITY PARK CAMPUS
- **Title:**

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

**SCCA Representative**

- **Recipient Name:** ROBERT MELTON
- **Department:** (Not Available)
- **Position:** SCCA Representative
- **Campus:** UNIVERSITY PARK CAMPUS
Recipient Name: CORTNEY SMITH  
Department: (Not Available)  
Position: SCCA Review  
Campus: UNIVERSITY PARK CAMPUS  

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

Recipient Name: CYNTHIA ZOOK  
Department: (Not Available)  
Position: SCCA Review  
Campus: UNIVERSITY PARK CAMPUS  

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  

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

Faculty Senate Review  

Recipient Name: CORTNEY SMITH  
Department: (Not Available)  
Position: Faculty Senate Review  
Campus: UNIVERSITY PARK CAMPUS  

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  

Concur: [Not Yet Reviewed]  
Comments: [Not Yet Reviewed]  
Reviewed On: [Not Yet Reviewed]
Curricular Information
Blue Sheet Item #: 
Review Date: 

SCRID Numbers
(BE 466):

UPLOADED DOCUMENTS:
Context Type: Supporting Documents
File Description: Writing Assignment Example (BE 460-466 Report)
File Name: BE 460-466 reports.pdf

Context Type: Syllabus
File Description: BE 466 Syllabus
File Name: BE_466_Syllabus.pdf
Show Team name and Report name

Date

Show picture of topic on front page

<table>
<thead>
<tr>
<th>Signature</th>
<th>% effort on report (total 100%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Author</td>
<td></td>
</tr>
<tr>
<td>Second Author</td>
<td></td>
</tr>
<tr>
<td>Third Author</td>
<td></td>
</tr>
<tr>
<td>Fourth Author</td>
<td></td>
</tr>
<tr>
<td>Fifth Author</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: The proposal (pages 1-8 of this template) is completed in BE 460. The proposal is the starting point in BE 466. Also, when preparing your proposal (BE 460), design specifications report - DSR (BE 466W) or final report (BE 466) please do not include the instructional text below. You are to submit a polished report with your own writing.

Executive Summary

The report should start with an Executive Summary (or also known as an Abstract) of approximately 200-400 words, summarizing the objective, contents, results, and conclusions as specifically as possible. The heading of the Executive Summary should be italic. This MUST be updated for subsequent reports with previous report data updated also. This essentially encompasses all of what an executive may read, so summarize what the major results are in this report in this paragraph.

Table of Contents

List paragraph numbers and indented subparagraph numbers and topic names in a column. Also list the appropriate page numbers of the paragraphs on the right side of the page.
1.0 Introduction

The entire body text of the report should be Times New Roman, 12, and justified. Major headings should be numbered consecutively, 1.0, 2.0, 3.0, etc, typed in bold face with a font size of 16. Sub-headings should be numbered consecutively, 1.1, 1.2, etc, typed in bold face with a font size of 14. Finally, sub-sub-headings should also be numbered consecutively, 1.1.1, 1.1.2, etc., typed in bold face with a size 12 font face. It is not recommended to go beyond three levels of headings.

Tense should be appropriate for the section and stage of the report. For example, the proposal may have content which describes what ‘will’ be done rather than what ‘has’ been done. The final report will not have any future tense except for future work.

Use the introduction section to provide some background information on your project. This introductory information should come from your literature search – Library, Internet, trade magazines, etc. All sources that are not your own ideas should be referenced. For your reports, please use the *parenthetical references: author-date system* (Ogot and Kremer, 2004, pg.71).

A sample reference list addressing each of the five main types of information sources is given at the end. These include: websites (Swanson, 1999), journals (Muriru and Daewoo, 2002), books (Zacharia and Daudi, 2001), conference proceedings (Peters et al., 2001) and patents (Wen-Cheng, 1994).

Finally, make sure that your report has page numbers from the second page through the appendix. This is often forgotten. Correct presentation is essential, so turn in a professional report!

1.1 Initial Problem Statement

Provide a brief paragraph describing your initial problem statement and the importance of the problem. Provide background information to educate the reader. Most of this should come from the problem statement that you received from your sponsor. Supply a brief description of the sponsor, if applicable.

1.2 Objectives

Provide in paragraph form a general explanation of what you expect your design will and will not show. This section contains the scope of work and limitations of your future design. (This is a difficult paragraph to write, but ensures that you are thinking clearly on general objectives and how you intend to address them.)

2.0 Sponsor Needs Assessment

2.1 Gathering Input

This section will describe the manner in which you gathered information from your sponsor or associated sources. Remember, engineering design projects require *quantification*! Specifications like "the system needs to be fast, efficient, light, cheap, robust, and simple" are merely starting points but by themselves useless in design. You want to get as much quantitative information from your sponsor as possible and identify what you don't know and must quantify. Your sponsor may not have every answer, which will require your team to develop these specifications. *Quantification is critical!* It is a foundation of engineering.

2.2 Weighting of Customer Needs
To create a weighted hierarchal customer needs list use a pairwise comparison chart as shown in Table 1. You first have to develop a list of customer needs based on your interactions with your sponsor and your own insights (e.g., has your sponsor missed anything which needs to be discussed?). Note, the needs listed in Table 1 are just examples. Yours may be much different. In this section you should detail how you developed a weighting for the customer needs. For example, for the case in Table 1 you would have to detail why would ease of use be less important (1.00) than ease of manufacturing (3.00). The greatest value of the pairwise comparison chart is the discussion it generates amongst team members as you try to assess what needs are most important (the same is true for many of the tables in the proposal) – do not assign this table to one team member to complete, rather work on it as a team!

All figures are numbered consecutively with figure captions typically placed at the bottom of the figure. Tables are also numbered consecutively with table captions at the top of the table. The pairwise comparison chart calculations should be done in MS Excel as it makes your life easier and the table can be selected, cut-and-paste from Excel into your report.

### Table 1. Example of a Pairwise Comparison Chart to Determine Weighting for Main Objectives/Categories. These will be specific to your project. This is just an example.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Safe</td>
<td>1.00</td>
<td>1.00</td>
<td>0.33</td>
<td>2.00</td>
<td>0.33</td>
<td>0.50</td>
<td>3.00</td>
<td>5.00</td>
<td>13.16</td>
<td>0.13</td>
</tr>
<tr>
<td>Ease of Use</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>0.33</td>
<td>1.00</td>
<td>1.00</td>
<td>4.00</td>
<td>4.00</td>
<td>13.33</td>
<td>0.13</td>
</tr>
<tr>
<td>Ease of Mfg</td>
<td>3.00</td>
<td>1.00</td>
<td>1.00</td>
<td>3.00</td>
<td>1.00</td>
<td>2.00</td>
<td>4.00</td>
<td>5.00</td>
<td>20.00</td>
<td>0.20</td>
</tr>
<tr>
<td>Cost</td>
<td>0.50</td>
<td>3.00</td>
<td>0.33</td>
<td>1.00</td>
<td>4.00</td>
<td>0.33</td>
<td>0.33</td>
<td>2.00</td>
<td>11.49</td>
<td>0.12</td>
</tr>
<tr>
<td>Efficient</td>
<td>3.00</td>
<td>1.00</td>
<td>1.00</td>
<td>3.00</td>
<td>1.00</td>
<td>3.00</td>
<td>4.00</td>
<td>5.00</td>
<td>21.00</td>
<td>0.21</td>
</tr>
<tr>
<td>Durable</td>
<td>2.00</td>
<td>1.00</td>
<td>0.50</td>
<td>3.00</td>
<td>0.33</td>
<td>1.00</td>
<td>2.00</td>
<td>3.00</td>
<td>12.83</td>
<td>0.13</td>
</tr>
<tr>
<td>Portable</td>
<td>0.33</td>
<td>0.25</td>
<td>0.25</td>
<td>0.50</td>
<td>0.25</td>
<td>0.50</td>
<td>1.00</td>
<td>0.50</td>
<td>3.58</td>
<td>0.04</td>
</tr>
<tr>
<td>Ergonomic</td>
<td>0.20</td>
<td>0.25</td>
<td>0.20</td>
<td>0.33</td>
<td>0.20</td>
<td>0.33</td>
<td>2.00</td>
<td>1.00</td>
<td>4.51</td>
<td>0.05</td>
</tr>
</tbody>
</table>

### 3.0 External Search

There are many sources of information that your team can use to educate yourselves and advance your project. You will have to do some independent learning to make your project successful. This is standard practice in any job, i.e., your university degree is the start of your education, not the end. Sources include journal articles, patents, books, written application notes, written industry standards, industry codes, product catalogues, and web resources. You should perform a literature search to obtain relevant information for your project. For example, patents contain a wealth of very specific information on devices and processes that can guide product or process development. Product catalogues often contain technical information on how products work, and can show you existing/competing products whose performance may need to be benchmarked against your specifications. Industry standards can detail important measurement procedures. Obtaining background information is essential for efficient execution of a design project. There is no benefit derived from spending time and resources ‘reinventing the wheel’.

You should perform a literature search that is relevant to your specific project. Your report should include each section below where some options exist to customize your report based on your project type. For example, teams working on devices should certainly conduct a patent search. However,
teams working on a natural resources project may benefit from searching industry standards or application notes. Use your best judgement but don’t exclude something just to shorten the task. The more effort you invest into this section, the easier your project will be.

3.1 Journal Articles (3 minimum)
Focus on peer-reviewed or professional journals.

3.2 Patents and/or industry standards/application notes (3 minimum)
Detail why the patent or other resource was important, i.e., what you learned and how you can apply it to your project.

3.3 Existing Products or Design Approaches (3 minimum)
Provide informative data as to what is on the market today or provide examples of what design approaches you have discovered and why they are important to your project.

3.4 Other sources (3 minimum)
These could be product catalogues, web sites, blogs, etc.

4.0 Engineering Specifications

4.1 Establishing Target Specifications and Specification Analysis
Provide a table (Table 2) of an initial set of target values that you established as a starting point for the project. Remember these are numbers with units. A specification is not “the design will be lightweight”. That is a qualitative description. A specification would be “The weight of the final unit is between 30 lbs and 55 lbs, or, more optimally, between 30 lbs and 40 lbs.” The limits of range could be values which cannot be exceeded. Provide a description of how and why you chose these values and how they relate to the customer’s needs.

Establishing specifications may also require an engineering analysis. For example, if a maximum flow rate needs to be specified, you may have to perform some fluid dynamics calculations to develop that specification. Such engineering analyses are expected in this report. You should include any engineering analysis used to develop your target specifications.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Limits of range</th>
<th>Ideal range or value</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power consumption</td>
<td>&lt; 350</td>
<td>&lt; 250</td>
<td>Watts</td>
</tr>
<tr>
<td>Weight</td>
<td>&lt; 100</td>
<td>&lt; 50</td>
<td>Lbs</td>
</tr>
<tr>
<td>Size</td>
<td>&lt; 1.0x0.5x0.2</td>
<td>&lt; 0.5x0.2x0.2</td>
<td>m (l x w x h)</td>
</tr>
<tr>
<td>Processing rate</td>
<td>&gt; 50</td>
<td>&gt; 100</td>
<td>Lbs/hour</td>
</tr>
<tr>
<td>Operating Temp.</td>
<td>0 to 60</td>
<td>-20 to 85</td>
<td>C</td>
</tr>
</tbody>
</table>

4.2 Relating Specifications to Customer Needs
Show a Needs-Metric Matrix in a QFD that has customer needs, specifications and values as detailed in class. An example is provided below in Table 3.
Table 3: Need-Metrics Matric

| Metric | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 |
|--------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Need   |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 1      | reduces vibration to the hands | * | * | * |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 2      | allows easy traversal of slow, difficult terrain | * |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 3      | enables high speed descents on bumpy trails | * | * | * |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 4      | allows sensitivity adjustment to cushion the shock | * | * | * |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 5      | preserves the steering characteristics of the bike | * | * | * |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 6      | remains rigid during hard cornering | * |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 7      | is lightweight | * |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 8      | provides stiff mounting points for the brakes | * |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 9      | fits a wide variety of bikes, wheels, and tires | * |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 10     | is easy to install | * |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 11     | works with fenders | * |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 12     | instills pride | * |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 13     | is affordable for an amateur enthusiast | * |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 14     | is not contaminated by water | * |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 15     | is not contaminated by grunge | * |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 16     | can be easily accessed for maintenance | * |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 17     | allows easy replacement of worn parts | * |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 18     | can be maintained with readily available tools | * |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 19     | lasts a long time | * |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 20     | is safe in a crash | * |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |

5.0 Concept Generation and Selection

5.1 Concept Generation

Generate at least 3 concepts, but you may want to generate more. In the body of this section explain the concept. The figures should be neat and if mechanical, SolidWorks solid models are preferred. Note: many products available from, for example, McMaster Carr come with SolidWorks and other CAD models. You often do not have to create these!

5.1.1 Concept 1: concept name

5.1.2 Concept 2: concept name

5.1.3 Concept 3: concept name

5.2 Concept Selection and Analysis

Provide a Concept Scoring Chart as shown in Table 4 evaluating each of your concepts. This chart is used to help your team both develop (by collectively analysing the concepts, leading to new
concepts) and select the best concept. Discuss how concepts can potentially be combined to develop an improved concept meeting your customer’s needs. A discussion of pros and cons of each design is required. Note that your selection criteria may be quite different than the examples shown in Table 4, but should match those that you developed for Table 1.

When developing and combining concepts, more detailed engineering analyses are typically required. For example, if power efficiency is a selection criterion, and your system requires a heat exchanger, a thermodynamic analysis may be required to select the best concept. Or if weight of a device is an issue, a structural analysis may be required to determine the best design requiring the least material. Such engineering analyses are expected in this report. You should include any engineering analysis used to develop and select your concepts.

Table 4. Pugh Concept Scoring Chart example

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety*</td>
<td>0.13</td>
<td>3</td>
<td>0.39</td>
<td>3</td>
<td>0.39</td>
<td>4</td>
<td>0.52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ease of Use</td>
<td>0.13</td>
<td>4</td>
<td>0.52</td>
<td>3</td>
<td>0.39</td>
<td>4</td>
<td>0.52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ease of Mfg.</td>
<td>0.2</td>
<td>2</td>
<td>0.40</td>
<td>3</td>
<td>0.60</td>
<td>2</td>
<td>0.40</td>
<td>1</td>
<td>0.20</td>
</tr>
<tr>
<td>Cost</td>
<td>0.12</td>
<td>3</td>
<td>0.36</td>
<td>3</td>
<td>0.36</td>
<td>3</td>
<td>0.36</td>
<td>1</td>
<td>0.12</td>
</tr>
<tr>
<td>Efficient</td>
<td>0.21</td>
<td>4</td>
<td>0.84</td>
<td>3</td>
<td>0.63</td>
<td>4</td>
<td>0.84</td>
<td>4</td>
<td>0.84</td>
</tr>
<tr>
<td>Durable</td>
<td>0.13</td>
<td>2</td>
<td>0.26</td>
<td>3</td>
<td>0.39</td>
<td>2</td>
<td>0.26</td>
<td>3</td>
<td>0.39</td>
</tr>
<tr>
<td>Portable</td>
<td>0.04</td>
<td>4</td>
<td>0.16</td>
<td>3</td>
<td>0.12</td>
<td>2</td>
<td>0.08</td>
<td>3</td>
<td>0.12</td>
</tr>
<tr>
<td>Ergonomic</td>
<td>0.05</td>
<td>3</td>
<td>0.15</td>
<td>3</td>
<td>0.15</td>
<td>3</td>
<td>0.15</td>
<td>3</td>
<td>0.15</td>
</tr>
<tr>
<td><strong>Total Score</strong></td>
<td></td>
<td>3.08</td>
<td>3.03</td>
<td>2.87</td>
<td>2.86</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Rank</strong></td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Relative Performance | Rating |
--- | --- |
Much worse than reference | 1 |
Worse than reference | 2 |
Same as reference | 3 |
Better than reference | 4 |
Much better than reference | 5 |

*See section 6 for details.

6.0 Safety analysis

Conduct a safety analysis, if appropriate, of the concepts being considered for selection. Use Table 5 for analysis. Rate using Hazard Analysis Scale. When evaluating and comparing concepts, prioritize based on highest total score for each hazard, i.e., what are the worst hazards for each concept and how do they compare. Describe which concept is best based on the evaluation. Rank each concept from 1-5 based on which is more safe (5 is most safe) and use in Table 4 in section 5.2.
If significant safety issues surface during this analysis, a concept may be eliminated for consideration.

Table 5: Hazard analysis for each concept

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Factors contributing to hazard</th>
<th>Effect/Injury Potential</th>
<th>Quantification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire &amp; Explosion</td>
<td>Gas line may wear through, spilling fuel. Potential ignition source</td>
<td>1st &amp; 2nd degree burns</td>
<td>9</td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td></td>
<td>1-9</td>
</tr>
</tbody>
</table>

7.0 Special Topics

7.1 Budget and Vendor Purchase Information
Provide a description of your budget, if applicable, and how these project funds will be spent. This budget will be updated in each report as more information is known up to the final report where all funds are known. The Final Report will not contain any estimates, as all the information should be completed. Major categories are travel, equipment, supplies, and poster. The Bill of Materials (BOM) should be included in the appendix, if applicable.

If your project does not require you to make purchases, you can simplify this section to Budget Information and include details relevant to the economic analysis you will complete in BE 466W. For example, if you will be generating a cost estimate on a channel design, you could include information here on what costs will be included and what sources will be used.

7.2 Project Management
Discuss project management approach and team capabilities. List your resumes in the Appendix. Include a deliverables agreement in the Appendix. Summarize how, with your management and technical skills, you will fulfil the project objectives. Provide a brief paragraph of major work that has to be completed before the end of the project (for proposal and DSR only).

7.3 Risk Plan
Discuss how your team will ameliorate or lessen any safety problems, if applicable. Risk factors can be marketing risk, technical risks, manufacturing risks, schedule risks or reliability risks but all are generally reducible to financial risk to the company or to the community. Provide a paragraph that identifies the critical path and one that also describes the risk plan table. See example of Risk Plan Table 6.
### Table 6. Risk Plan example

<table>
<thead>
<tr>
<th>Risk</th>
<th>Level</th>
<th>Actions to Minimize</th>
<th>Fall Back Strategy</th>
</tr>
</thead>
</table>
| Change in customer specification | Moderate | - Involve customer in process of refining specifications  
|                                  |       | - Work with customer to estimate time and cost penalties of changes                  | - Add time to schedule for that particular task         
|                                  |       |                                                                                        | - Additional budget required                           |
| Schedule delays                  | High  | - Constantly track project progress  
|                                  |       | - Look for ways to accelerate activities                                             | - Build in safety time                                 
|                                  |       |                                                                                        | - Re-allocate resources or staff                        |
| Delays in order placement or     | Moderate | - Make sure parts are in stock  
| delivery                          |       | - Make sure purchasing department has all needed information                         | - Build it yourself                                     |
|                                  |       |                                                                                        | - Drive to NJ and pick it up                            |
| Product does not function as     | Low   | - Test early and often  
| predicted                         |       | - Be aware of risks of new technology                                               | - Alternative design                                   
|                                  |       |                                                                                        | - Different material, technology, etc                   |
| Customer not satisfied           | Moderate | - Understand the customer's needs (voiced and non-voiced)                           | - Discuss ways to fix the problem                       |

### 7.4 Ethics Statement

Provide a paragraph of how your team will abide by established ethical standards. This can be in this section or in the Appendix.

### 7.5 Environmental Statement

Provide a paragraph of how your team will meet or exceed environmental standards. This can be in this section or in the Appendix.

### 7.6 Communication and Coordination with Sponsor

Specify the interaction with your sponsor. Provide a listing of the schedule and the form of communication whether it is visits or conference calls.

### 7.7. Timeline

Develop a timeline with milestones for your project work. Include a Gantt chart with milestones, tasks and responsibilities as well as a short paragraph introducing the Gantt chart. Show enough detail to be meaningful and aid your team in making continued progress.

**NOTE: End of Proposal, completed in BE 460**
8.0 Detailed Design

The subsections below are outlined for a project that involves developing a design, prototyping (building), and testing. However, your project may require you to create a conceptual design but not build a physical prototype. For example, your project may require you to complete an analysis of multiple conceptual design alternatives in which case you may decide to have one subsection for each design. The subsections in 8.0 and 9.0 can be adjusted and re-ordered for your specific project but you must cover the following topics: engineering analyses completed for your design(s) (e.g., the detailed analyses completed to determine dimensions of open channel), description of the selection and/or optimization process for materials and/or components, procedure developed to test design (testing can be simulation-based!), discussion of test results, detailed design drawings and/or schematics, and economic analysis.

8.1 Detailed Analysis

What theoretical analyses were necessary to prove your design? Provide results of any calculations or computer simulations that you did. If you perform a Finite Element Analysis ensure that you also have done a hand calculation to verify the order of magnitude results or experimental results. Did you have to make an initial prototype to prove an unknown concept or assembly method? If so, describe what you did. Summarize the results with reference to the output data in the Appendix.

8.2 Material and Component Selection

What materials or software were chosen for the major parts of the prototype or design? If applicable, what components were chosen for the major parts of the prototype or design?

8.3 Selection Process and Design Optimization

Describe the process you went through for picking the materials for the prototype or design, i.e., what tradeoffs (availability, cost, strength, flexibility, machinability, weldability, green material, recyclability, etc.) were the driving factors. Describe the process you went through for picking the components for the prototype, i.e., what tradeoffs (availability, cost, ergonomics, features, speed, size, green material, etc.) were the driving factors. If applicable, explain a quantitative optimization analysis performed to select a material or size a component in your design.

8.4 Drawings

Provide detailed professional drawings that quantify your detailed design. For example, CAD drawings could be used for a mechanical part. The vast majority of the details and shop drawings should be placed in the appendix. The drawings should be appropriately noted to be viewed in the appendix. All assemblies and parts drawings should be included. These drawings should be modified in the Final Report if during the assembly or machining phase there was a need for revision.

8.5 Test Procedure

Describe your experimental or simulated test procedures. Be specific on how you intend to evaluate/test your solution. This should be a well thought-out procedure with details on how you will test the parts or design for meeting the customer’s needs. This is not just a basic statement stating that the parts will be tested to meet some customer requirements, but a list of detailed steps of what you will be doing and what equipment you will be using.
If you are working on a conceptual design project, your test procedure will most likely involve simulation using software (e.g., HEC-RAS, SuperPro Designer). For a natural resources project, your test procedure might also include an exceedance analysis. For example, if you designed your stormwater BMP for a 25-yr storm, look at how it would perform under a 50- and 100-yr storm. What percentage of the storm (in terms of peak flowrate and volume) will bypass the BMP?

NOTE: End of Design Specifications Report (DSR)
9.0 Final Discussion

9.1 Implementation Processes
Provide enough implementation or construction detail such that a person could reproduce the design from your description and pictures. Pictures during the construction process are very informative. A few pictures can be inserted here but most should be in the Appendix. Again, if any improvements were made or if any drawings changed from the earlier detailed design report then replace old drawings with new drawings.

If your project involves a conceptual system design, you might use this section of the report to describe how the system would be implemented in practice. For example, the design may be implemented in phases. If you are proposing to incorporate an open channel into a landscape, this would be implemented through a cut/fill process. Remember that you can re-order (and/or re-name) report subheadings so sections 8.0 and 9.0 fit well with your specific project!

9.2 Test Results and Discussion
This is a discussion on how well your design fairied during the testing phase. Answer the question of whether or not it passed your expectations as well as meeting the customer’s needs and specifications. Summarize your data with the major results here. Include all of your data in the Appendix.

10.0 Economic analysis
An economic analysis should be performed demonstrating the value of your design. For example, you may perform a net present value (NPV) analysis for a product or system you developed. State all assumptions. Include analysis as shown in Table 7. In some cases, you may not be able to obtain accurate information, in which case you can provide your best estimate.

For projects where you are designing a product that could be manufactured, your NPV analysis might include development, ramp-up, marketing and support, and production and sales. Development should include any capital (facilities and equipment), purchased services, salaries (with overhead), materials and supplies. Ramp up costs should include additional capital (facilities and equipment), tooling, additional salaries (with overhead) and training. Marketing and support should include purchased services (including advertising), additional salaries (with overhead), legal, and warranty/repair costs. Production and sales should include purchased materials, supplies, and services, additional salaries (with overhead), sales support, training, facilities (including energy), shipping, etc. You may want to add additional topics based on your specific project.

For projects where you are designing a system to be built in a community, your NPV analysis might include capital investment (engineer’s cost estimate - labor, materials, site preparation, excavation, etc.) and maintenance. You may want to add additional topics based on your specific project.

Based on this analysis, provide a brief discussion on whether your product or system would be a good investment, and what factors most impact profitability. Or as appropriate, provide a brief discussion about how your final design economics compare to a benchmark or to alternative designs. In some cases, the NPV will be negative which is the nature of some projects.
Table 7. NPV analysis chart.

<table>
<thead>
<tr>
<th>NPV analysis</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Q 1</td>
<td>Q 2</td>
<td>Q 3</td>
<td>Q 4</td>
</tr>
<tr>
<td>Development</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ramp-up</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marketing and support</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production and sales</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Period cash flow</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NPV</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: provide a discussion on what discount rate you decide to use.

11.0 Conclusions and Recommendations

Add concluding thoughts that summarize your project, tying your final design back to the customer needs and specifications. This should show the process from beginning to end and finish with recommendations of what would be done to improve the next version of this project. In the appendix, rate your team in two (2) areas on a scale from 1-10 in each category, where 10 is meeting all needs in Design Criteria Satisfaction. This is twofold; you must rate yourself on meeting the customer’s needs as well as the impact of your engineering solutions on global and societal needs. First, rate yourself on meeting the customer’s needs and then generally write a short paragraph how your design met those needs. Second, rate yourself on global and societal needs which your team’s solutions have met and to what level. Write an accompanying paragraph about some specific decisions you made during the project and how the global and societal needs were met. These global and societal needs may involve safety, environment, sustainability, bioethics or basic human needs.
References (Times New Roman, 14, Bold)

Note: That for the author-date system, references are listed in alphabetical order.


Appendix: (listed in sections A, B, C, D....)

SolidWorks working drawings and a BOM of the final design should be placed in an appendix. Additional paragraphs concerning resumes, established communication dates with sponsor, calculations, patent search details, ethics and environmental statements may also be included here. If other items are too bulky, the vast majority of these tables, graphs, other should be listed here. Note these items should be listed in the proper paragraphs and then referenced to see details in the appendix, page ___.

NOTE: End of Final Report

Additional information:

For section 6.0 Safety Analysis, use the following Hazard Analysis Scale:

<table>
<thead>
<tr>
<th>Exposure</th>
<th>Likelihood</th>
<th>Consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rating Descriptor</td>
<td>Rating Descriptor</td>
<td>Rating Descriptor</td>
</tr>
<tr>
<td>9 Continuous</td>
<td>9 Almost happen</td>
<td>9 Death, complete disability</td>
</tr>
<tr>
<td>7 Once daily</td>
<td>7 Very possible</td>
<td>7 Permanent injury, partial injury</td>
</tr>
<tr>
<td>Frequency</td>
<td>Description</td>
<td>Likelihood</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
<td>------------</td>
</tr>
<tr>
<td>5</td>
<td>Once per use per season or annually</td>
<td>Some conditions favorable to happen</td>
</tr>
<tr>
<td>3</td>
<td>Once in life of product</td>
<td>Remotely possible but not likely</td>
</tr>
<tr>
<td>1</td>
<td>Theoretically possible but highly unlikely</td>
<td>Practically impossible to happen</td>
</tr>
</tbody>
</table>
Supervisors:  

Jeffrey Catchmark, 109 Agricultural Engineering Building  
Telephone: 814-863-0414; email: jmc102@psu.edu  
Office hours: T 2:30-3:30pm and by appointment or drop in anytime!

Megan Marshall, 224 Agricultural Engineering Building  
Telephone: 814-865-3392; email: mnm11@engr.psu.edu  
Office hours: M 4:30-5:30pm, R 2-3pm, F 12-1pm, by appointment or drop in anytime!

Time/Location:  

General project resources and information available on Canvas within the BE 466 course folder.

Course Description:  
BE 466 is the second of a 2-course capstone design experience. Through this experience, students develop skills and techniques for managing and executing engineering design projects. These skills are applied to a project sponsored by faculty, industry or other organizations. Project teams engage in all facets of the design process. This includes problem identification and clarification, planning of the project, formulation of design specifications, development and evaluation of conceptual designs, development of detailed designs, implementing the design, and analysis and documentation of results. The preparation and refinement of various documents including notebook entries, status reports, a design specification report, and a final report will allow students to improve their writing skills. Students may also travel to sponsor sites, when possible, to gain an understanding of existing processes and problems and to assess the sponsor's needs.

Course Objectives: Upon completing this course, students should be able to:
01. Interact with a sponsor (supervisor, co-worker, client) to formulate equitable design criteria (time, cost, specifications) for a meaningful engineering project
02. Develop an action plan to complete the project on time and within budget
03. Conceptualize systems to satisfy design criteria
04. Analyze technical and economic merits of design alternatives
05. Work effectively in a team that includes co-workers, customers and vendors
06. Communicate well using verbal, written and electronic methods
07. Develop and improve writing skills
08. Demonstrate professionalism in interactions with colleagues, faculty, and staff
09. Demonstrate an appreciation of economic, global, societal, and ethical issues
10. Demonstrate knowledge of contemporary issues

Pre-requisite:  BE 460.

Grading Table: Final grade will be based on:

- Peer evaluations: 15%
- Sponsor evaluation: 10%
- DSR report: 15%
- Final report: 25%
- IPAC poster presentation: 10%
- Final presentation: 10%
- Update memos and electronic notebook: 10%
- Participation/professionalism: 5%

Grading Scale:
Course Policies:

- **Academic Integrity:** Students are expected to abide by the College of Engineering's Academic Integrity policy, [http://www.engr.psu.edu/faculty-staff/academic-integrity.aspx](http://www.engr.psu.edu/faculty-staff/academic-integrity.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. 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 time/date specified as shown in the schedule. 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 the instructor's attention within one week after the graded material was handed back. Scores will not be reconsidered after this time period has elapsed.

- **Participation:** Participation is expected during each class. As a professional courtesy, please inform the instructor prior to any anticipated legitimate class absences. Also see the Faculty Senate Policy on Class Attendance (42-27). The participation component of your final grade will be assessed in multiple ways: your attendance in class lectures, your participation in team meetings with the instructor, and your participation in in-class activities.

- **Cell Phones:** Turn cell phones off upon entering classroom.

Additional Course Requirements:

- **Project Notebook:** Each team is responsible for organizing and maintaining an electronic project notebook throughout the semester. The notebook should be managed using Google Drive. The notebook should contain drawings, concepts, ideas, & anything discussed regarding the project (for example, hand drawings can be imbedded in the notebook as scans or photos). The journal is a working document so neatness is not important though it must be readable and dated. The notebook will be reviewed periodically by instructors.

- **Progress Reports:** Each team must submit a weekly progress/status report including an updated schedule to both the project sponsor and instructor. Be aware that minor delays in the beginning cause major problems at the end.

- **Labor Division:** Groups will prepare a document showing division of labor and ground rules. This will be documented. Again, teamwork is essential in this class.

- **DSR and FINAL reports:** The Design Specification Report (DSR) and Final Report are major deliverables in BE 466. See Canvas site for template, details and evaluation rubric.

- **Oral Presentations:** Will be evaluated based on preparation, visual aids, stage presence, and overall effectiveness. All team members should have a role and present a portion of the presentation. Time allotted may vary depending upon groupings and number of groups. See Angel site for template, details and evaluation rubric.

- **Self and Peer Assessment:** Periodically throughout the course of the semester you will have the opportunity to assess your own performance, and your performance will be assessed by your peers. Peers will have the opportunity to assess your level of involvement, effort and productivity. This is an important component of your overall evaluation and worth 15% of your final grade.

- **Professionalism:** You should conduct yourself with high professional standards and have an ethical and positive social interaction with the sponsor, team members, staff and instructors.

- **Safety:** Any use of department facilities requires the appropriate safety training. Your instructor will review this safety training at the start of the semester.

Instructor, sponsor and student roles: The instructor is there to assist you in locating information and act as a coach or
consultant on technical issues, but will not make design decisions for you. The design problems specified by your sponsor are just the start of the design process. It is the responsibility of the students and their team to further define the problem through effective interactions with their sponsor. Excellent student teamwork and communications are essential in this class!

Writing across the curriculum: This course satisfies the writing across the curriculum graduation requirement, and as indicated above, includes several writing assignments. There are assignments that are designed to help you learn to write in your discipline. These include the progress reports, design specifications report, and final report. There are also assignments where you will write to learn about your design process or your team dynamics, such as the project notebook and self/peer assessments, respectively. In BE 466, writing is a developmental process. You start with your project proposal from BE 460; throughout the semester, you will receive feedback, document ideas in your project notebook, refine your design, and edit your writing until you complete the final design report.

Course Deliverables: The following is expected at the conclusion of this course:
- Copy of Final Report in both doc and pdf formats.
- Copy of Final Presentation in ppt format.
- Copy of Poster in ppt format.
- Electronic course notebook.

Important Dates/ Major Milestones:
- Design Specifications Report (DSR) due – TBD
- IPAC poster session – TBD
- Final presentations – TBD
- Sustainable Communities Collaborative (SCC) closing event – TBD
- Final Report due – TBD
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>John Hannan</td>
<td>jjh9</td>
<td>Engineering (EN)</td>
<td>Not Available</td>
</tr>
<tr>
<td>REBECCA JANE PASSONNEAU</td>
<td>rjp49</td>
<td>Engineering (EN)</td>
<td>Not Available</td>
</tr>
</tbody>
</table>

College with curricular responsibility: Engineering (EN)

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

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

Course Designation

(CMPSC 442) Artificial Intelligence

Course Information

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

□ Common Course

GE Learning Objectives

□ GenEd Learning Objective: Effective Communication
□ GenEd Learning Objective: Creative Thinking
□ GenEd Learning Objective: Crit & Analytical Think
□ GenEd Learning Objective: Global Learning
□ GenEd Learning Objective: Integrative Thinking
□ GenEd Learning Objective: Key Literacies
GenEd Learning Objective: Soc Resp & Ethic Reason

Course Outline

A brief outline or overview of the course content:
AI is presented in terms of implementation of rational agents. The content covers a wide range of topics pertaining to problem solving, knowledge and reasoning, learning and prediction, and communicating with rational agents.

A listing of the major topics to be covered with an approximate length of time allotted for their discussion:
Major topics are selected from problem solving as search, from basic search methods to stochastic informed search; games and adversarial agents; constraint satisfaction problems or other factored representations; logic and inference; probabilistic models; methods to handle textual or spoken language; machine learning. Each major topic selected is given roughly one week.

Course Description:
This course provides an overview of the theory, research paradigms, implementation techniques, and philosophy of artificial intelligence. A wide range of topics are covered that include search, problem solving, and game-playing, as well as knowledge, reasoning and belief networks. The material includes a brief introduction to machine learning and classification problems. Through programming assignments that sample these topics, students acquire an understanding of what it means to build rational agents of different sorts, especially the contrast between agents that operate in certain versus uncertain environments. Applications to specific areas of AI such as language and vision are presented.

The name(s) of the faculty member(s) responsible for the development of the course:
- Name: REBECCA JANE PASSONNEAU (rjp49)
  Title: PROFESSOR OF CSE
  Phone: +1 814 865 9233
  Address: 343K INFO SCI & TECH BL UNIVERSITY PARK UNIVERSITY PARK, PA 16802
  Campus:
  City:
  Fax:
- Name: John Hannan (jjh9)
  Title:
  Phone:
  Address:
  Campus:
  City:
  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 students will learn basic techniques to construct artificial intelligent agents from the vantage of both theory and practice, and will learn about the role of intelligent systems in current and future technology.

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.
Students are evaluated on class participation in socratic discussion, homework assignments that require students to solve problems through programs, and potentially through midterm or final exams.

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.
The course depends on students’ ability to program, especially object oriented programming, and helps prepare them for more focused courses in AI such as natural language processing, vision, machine learning, or data mining.

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.
Students must be in the CMPEN_BS, CMPSC_BS, MATH_BS, or STAT_BS majors or in the CMPDS option. This course may also be taken as a technical elective for all of the majors listed here.

A description of any special facilities:

Frequency of Offering and Enrollment:
Yearly in the fall, for a total enrollment of 75

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 current prerequisite for this course is CMPSC122 or its equivalent, which students are recommended to take in the spring of their first year. CMPSC 442, however, is aimed primarily at juniors and seniors. It prepares juniors for data mining, machine learning, and AI topics such as vision, natural language processing and robotics. It prepares seniors for the job market or further academic studies so that their knowledge of standard AI algorithms is practical as well as theoretical. For students to learn to implement AI algorithms, they need to have experience with programming across several semesters of course work. The experience in object-oriented programming students gain in CMPSC 221 will prepare them for the more advanced problems in CMPSC 442. Because the students will have experience in both python and Java, it allows the instructor a choice between two object oriented languages. The homework assignments ask students to apply their programming skills to the solution of a wide range of search problems, puzzles, logical reasoning, and simple machine learning problems, such as text classification. The requested change to the pre-requisites makes it possible for AI to be a genuine computer science course in which students learn to implement rational agents through programming assignments, as opposed to a theoretical overview that includes more trivial programming assignments or questions.

General Education Designation Requirements

Campuses That Have Offered (CMPSC 442) Over The Past 4 Years

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: ASAD AZEMI  
Department: School of Engr Technology and Commonwealth Engr  
Position: Consultation  
Campus: BRANDYWINE CAMPUS  
Title: ASSOC PROF ENGINEERING

(11) Request sent: 10/24/2016 at 7:30 AM  
Concur: No, this proposal needs significant changes  
Comments: The proposal needs to include (copy) the required information under "course justification" section even if those information are not going to change. The "justification for changing the proposal" is not complete and does not provide adequate information. It needs to state the current requirement and the proposed requirement and the justification for the change with some level of details. The current prerequisite is CMPSC 122, which is an (intermediate) object oriented programming course.  
Reviewed On: 10/24/2016 at 10:28 AM  
Initiator Comments: The proposal will be revised to include the missing information in the course justification, as well as the current prerequisites and the justification for the change.

(22) Request sent: 11/7/2016 at 7:30 AM  
Concur: Yes  
Comments: Under the prerequisite you need to enter the new course and take out the old one.  
Reviewed On: 11/7/2016 at 9:17 AM

Recipient Name: CHARLES GASTON  
Department: (Not Available)  
Position: Consultation  
Campus: YORK CAMPUS  
Title: ASST. PROF. ENGINEERING

(8) Request sent: 10/17/2016 at 7:30 AM  
Concur: Yes  
Comments: Almost all of the prior comments have addressed the Python requirement. My opinions: 1. Requiring a specific language for assignments makes sense in terms of grading, helping students and examples used in class. 2. If there is a programming prerequisite or corequisite, it should correspond to the language used in class. (The instructor should be able to waive that requirement for students with programming experience and willingness to learn something new. (My son taught himself at least six programming languages.) 3. Requiring Python, specifically, is reasonable. I have programmed in at least a dozen languages, but never Python. Nevertheless, I like what I have learned about it. For instance, from safaribooksonline: "Compared to alternatives like C++, Java, and C#, Python programming seems astonishingly simple to most observers. To run a Python program, you simply type it and run it. There are no intermediate compile and link steps, like there are for languages such as C or C++." 4. I am inclined to believe that, with adequate relevant examples, logical thinkers who have programmed in other languages could easily pick up enough Python to complete class assignments.  
Reviewed On: 10/17/2016 at 11:15 AM

Recipient Name: DAUDI WARYOBA  
Department: School of Engr Technology and Commonwealth Engr  
Position: Consultation  
Campus: DUBOIS CAMPUS  
Title: ASST PROF / ENGINEERING

(10) Request sent: 10/12/2016 at 9:53 AM  
Concur: Yes  
Comments: I do agree with other reviewers, it should be clear if you are changing prerequisite from CMPSC 122 to CMPSC 221. If CMPSC 221 is the prerequisite, will the transition from Java to Python be responsibility of the student or will that be covered in the class?  
Reviewed On: 10/23/2016 at 3:27 PM
Title: ASSOC PROF GEN ENG
Recipient Name: DAVID BRUCE MEREDITH
Department: School of Engr Technology and Commonwealth Engr
Position: Consultation
Campus: FAYETTE CAMPUS
Title: ASSOC PROF GEN ENG

Request sent: 10/24/2016 at 7:30 AM
Concur: Yes
Comments: (Completed By Default - Exceeded Time Limit)
Reviewed On: 10/27/2016 at 7:15 AM

Title: SR LECT ENGINEERING
Recipient Name: EDWARD EVANS
Department: Engineering
Position: Consultation
Campus: PENN STATE ERIE, THE BEHREND COLLEGE
Title: SR LECT ENGINEERING

Request sent: 10/12/2016 at 9:53 AM
Concur: Yes
Comments: The faculty of the Dept. of Computer Science & Software Engineering at Behrend College suggest that requiring the use of Python to complete assignments is an unnecessary restriction on the class. Their recommendation is to permit the use of any applicable programming language.
Reviewed On: 10/13/2016 at 11:05 AM

Title: INSTRUCTOR
Recipient Name: HAROLD N SCHOLZ
Department: (Not Available)
Position: Consultation
Campus: LEHIGH VALLEY CAMPUS
Title: INSTRUCTOR

Request sent: 10/12/2016 at 9:53 AM
Concur: Yes
Comments:
Reviewed On: 10/13/2016 at 10:13 AM

Title: LECT ENGINEERING
Recipient Name: JAMES HENDRICKSON
Department: (Not Available)
Position: Consultation
Campus: (Not Available)
Title: LECT ENGINEERING

Request sent: 10/24/2016 at 7:30 AM
Concur: Yes
Comments: (Completed By Default - Exceeded Time Limit)
Reviewed On: 10/27/2016 at 7:15 AM

Title: ASSOC PROF ENGINEERING
Recipient Name: JANICE MARGL
Department: (Not Available)
Position: Consultation
Campus: (Not Available)
Title: ASSOC PROF ENGINEERING

Request sent: 10/24/2016 at 7:30 AM
Recipient Name: JENIFER MARY SHANON
Department: (Not Available)
Position: Consultation
Campus: (Not Available)
Title: LECTURER ENGINEERING

Request sent: 10/24/2016 at 7:30 AM
Concur: Yes
Comments: (Completed By Default - Exceeded Time Limit)
Reviewed On: 10/27/2016 at 7:15 AM

Recipient Name: KENNETH DUDECK
Department: (Not Available)
Position: Consultation
Campus: (Not Available)
Title: ASSOC PROF ENGR

Request sent: 10/24/2016 at 7:30 AM
Concur: Yes
Comments: (Completed By Default - Exceeded Time Limit)
Reviewed On: 10/27/2016 at 7:15 AM

Recipient Name: KHALED AMLEH
Department: UC Engineering
Position: Consultation
Campus: MONT ALTO CAMPUS
Title: ASSOC PROF ENGINEERING

Request sent: 10/12/2016 at 9:54 AM
Concur: Yes
Comments:
Reviewed On: 10/23/2016 at 7:08 AM

Recipient Name: Linda Null
Department: Computer Science
Position: Consultation
Campus: PENN STATE HARRISBURG,
THE CAPITAL COLLEGE
Title: ASSOC PROF COMPUTER SCIEN

Request sent: 10/12/2016 at 9:54 AM
Concur: Yes
Comments: Will the course do an overview of Python or an introduction (since 121 and 122 will remain C++)? The prereq is changing from 122 to 221. The justification indicates that the change is necessary because students "should have advanced from introductory programming to a [sic] some facility with object oriented programming." CMPSC 122 is intermediate programming (not introductory) and also gives students "some facility" with OOP. Perhaps the justification should indicate that the students need a more advanced background in OOP, since 122 currently accomplishes what the justification proposes.
Reviewed On: 10/14/2016 at 3:42 PM
Recipient Name: MAJID R CHATSAZ  
Department: School of Engr Design, Technology and Prof Prgrms  
Position: Consultation  
Campus: WORTHINGTON SCRANTON CAMPUS  
Title: ASST PROF GENERAL ENGR

Request sent: 10/12/2016 at 9:54 AM  
Concur: Yes  
Comments:  
Reviewed On: 10/15/2016 at 2:03 PM

Recipient Name: MICHAEL ROBERT GALLIS  
Department: (Not Available)  
Position: Consultation  
Campus: (Not Available)  
Title: ASSOC PROF PHYSICS

Request sent: 10/24/2016 at 7:30 AM  
Concur: Yes  
Comments: (Completed By Default - Exceeded Time Limit)  
Reviewed On: 10/27/2016 at 7:15 AM

Recipient Name: RICHARD CIOCCI  
Department: Science, Engineering And Technology  
Position: Consultation  
Campus: PENN STATE HARRISBURG, THE CAPITAL COLLEGE  
Title: ASSOC PROF MECH ENG

Request sent: 10/12/2016 at 9:54 AM  
Concur: Yes  
Comments:  
Reviewed On: 10/12/2016 at 10:24 AM

Recipient Name: RICHARD SINGER  
Department: Business And Engineering  
Position: Consultation  
Campus: ALTOONA CAMPUS  
Title: SR INSTR COMPUTER SCIENCE AND ENGINEERING

Request sent: 10/12/2016 at 9:54 AM  
Concur: Yes  
Comments: I concur with the general course description and topics; however, I believe the reference to python should be eliminated. Also the section for Relationship of Course to Major, Option, Minor, or General Education should be filled in. If students "should have advanced from introductory programming to [some] [a] facility with object-oriented programming" then I believe there should be (a) prerequisite(s). Choose either "a" or "some" in the previous sentence. I don't believe these are "significant changes" so I approve.  
Reviewed On: 10/12/2016 at 12:21 PM

Recipient Name: RONALD LAND  
Department: (Not Available)  
Position: Consultation  
Campus: (Not Available)  
Title: ASSOC PROF SETCE
Concur: Yes
Comments: (Completed By Default - Exceeded Time Limit)
Reviewed On: 10/27/2016 at 7:15 AM
<table>
<thead>
<tr>
<th>Recipient Name</th>
<th>Department</th>
<th>Position</th>
<th>Campus</th>
<th>Concur</th>
<th>Comments</th>
<th>Reviewed On</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Head of Department</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHITARANJAN DAS</td>
<td>(Not Available)</td>
<td>Head of Department</td>
<td>UNIVERSITY PARK CAMPUS</td>
<td>[Not Yet Reviewed]</td>
<td>[Not Yet Reviewed]</td>
<td>[Not Yet Reviewed]</td>
</tr>
<tr>
<td><strong>SCCA Representative</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ROBERT MELTON</td>
<td>(Not Available)</td>
<td>SCCA Representative</td>
<td>UNIVERSITY PARK CAMPUS</td>
<td>[Not Yet Reviewed]</td>
<td>[Not Yet Reviewed]</td>
<td>[Not Yet Reviewed]</td>
</tr>
<tr>
<td><strong>Dean of the College</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PETER BUTLER</td>
<td>(Not Available)</td>
<td>Dean of the College</td>
<td>UNIVERSITY PARK CAMPUS</td>
<td>[Not Yet Reviewed]</td>
<td>[Not Yet Reviewed]</td>
<td>[Not Yet Reviewed]</td>
</tr>
<tr>
<td><strong>SCCA Subcommittee Review</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CORTNEY SMITH</td>
<td>(Not Available)</td>
<td>SCCA Subcommittee Review</td>
<td>UNIVERSITY PARK CAMPUS</td>
<td>[Not Yet Reviewed]</td>
<td>[Not Yet Reviewed]</td>
<td>[Not Yet Reviewed]</td>
</tr>
<tr>
<td>CYNTHIA ZOOK</td>
<td>(Not Available)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SCCA Subcommittee Review

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

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

SCCA Review

Recipient Name: CORTNEY SMITH
Department: (Not Available)
Position: SCCA Review
Campus: UNIVERSITY PARK CAMPUS

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

Recipient Name: CYNTHIA ZOOK
Department: (Not Available)
Position: SCCA Review
Campus: UNIVERSITY PARK CAMPUS

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

Faculty Senate Review

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

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

Blue Sheet Item #:
Review Date:

SCRID Numbers

(CMPSC 442):

Recipient Name: CORTNEY SMITH
Department: (Not Available)
Position: Faculty Senate Review
Campus: UNIVERSITY PARK CAMPUS
Title:

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