FORT LEWIS COLLEGE
Department of Physics and Engineering

Course: ENGR 215 – Engineering Fundamentals 3
Term: Fall 2014
Instructor: Dr. Laurie Williams, room 632 BH, 970-247-7160, williams_l@fortlewis.edu
Instructor: Dr. Don May, room 601 BH, 970-247-7545, may_d@fortlewis.edu

Textbook:

David F. Beer, David McMurrey, 2009, *A Guide to Writing As an Engineer / Edition 3*, 3rd Edition ISBN:0470417013, Wiley, John & Sons
Other cost: You are required to purchase materials needed for design projects. Expect to spend $50 to $100.

COURSE INFORMATION

Catalog Description

A course in engineering problem solving including the study of engineering fundamentals using a formal design process. This is a project centered course where students learn to plan, design, and manage a project; to construct and test prototypes; to analyze results and communicate findings using a variety of methods. The engineering profession and professional ethics are discussed.

Required Course: 3 credit hours (lecture)
Prerequisite: ENGR 103 (Engineering Fundamentals I)
Pre or Co-requisite: ENGR 104 (Engineering Fundamentals II)

COURSE OUTCOMES: (with corresponding ABET outcomes)

1. Learn to use a formal design process (Outcome c)
2. Use engineering science, research, analysis, and modeling as part of the design process (Outcome b, j)
3. Develop and use plans, specifications, and standards (Outcome c, h)
4. Introduce prototyping, testing, and safety (Outcome k)
5. Introduce engineering project management and teamwork (Outcome d)
6. Improve technical communication through writing, graphics, and presentation skills (Outcome g)
7. Explore engineering ethics (Outcome f)
8. Introduce the principles of sustainable design (Outcome c, h)

RELEVANT ABET OUTCOMES:

(b) An ability to design and conduct experiments, as well as analyze and interpret data.
(c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
(d) An ability to function on multidisciplinary teams.
(f) An understanding of professional and ethical responsibility.
(g) An ability to communicate effectively.
(h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
(j) A knowledge of contemporary issues.
(k) An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

TOPICS

- The design process
- Project management
- Problem definition
- Working as a team
- Research and engineering requirements
- Generating options
- Detailed design
- Prototyping
- Documentation and communication
- Design for sustainability
- Professional engineering
- Ethics
- Safety in engineering

Attendance: Attendance in class is expected. If a class is missed, the student is responsible for the material covered and any announcements including changes in the schedule.

Grading:

1. Projects (50%) – Based on the understanding and effective implementation of the design process and the elements of good design as evidenced in the ongoing process and the final products of design projects.
2. Assignments (20%) – Based on writing, presentations, analyses, and other assignments not assessed in item 1.
3. Exams (20%)
4. Participation, Peer Review, professionalism, leadership (10%) – Based on attendance, participation in discussions, ability to work in design teams, ability to meet schedules, willingness to take a fair share of leadership roles, peer review results, appropriate use of the shop and work days, and other similar items.
5. The ABET assessment rubrics for teamwork and oral presentations are used in evaluating performance in this class. You will find them posted on the course Moodle page.

Grades:

Grades will be no worse than:
>90 - A
>80 - B
>75 - C
>60 - D
<60 - F

Special Needs Accommodations: In accordance with the policy of Fort Lewis College any student in need of special accommodations based on a documented disability please speak with the instructor or contact Dian Jenkins, Disability Services Coordinator, Phone: (970) 247-7459.

DEPARTMENT POLICIES: For policies on grading, syllabus changes, disputes with instructor, academic dishonesty, and other important issues see Canvas Course Management page.

Course Schedule and Assignments, Engr 215, Fall 2014

- All assignments are due at the beginning of the listed class period
- Nearly all assignments are completed as group work and thus one assignment is submitted for the group.
- Show the course section, assignment title, and the full name of all group members and date on the first page.
- No late work will be accepted unless prearranged with the instructor.
- All assignments are typed or electronic submission unless specifically stated. Submit electronic documents in pdf format. Use Google Drawing© to create flowcharts and diagrams. Sketches can be scanned (check resolution and contrast for legibility before submitting).

Wk	Period	Topics	Assignments / Due Date
1	1, M, 9/1 2, W, 9/3 3, F, 9/5	**Project 1** The design process **1.Problem definition** Problem formulation Needs assessment Objectives (tree) Objective metrics Constraints	***Project 1 deliverables due Per 10*** **All wk 1 assignments due per 5:** Objectives tree (use google drawing) Objective metrics Constraint list Revised problem statement
2	4, M, 9/8 5, W, 9/10 6, F, 9/12	**2.Research and requirements** Research Design functions Engineering requirements **3.Generating options** Design space and the morphological chart Precedent Design selection	**All wk 2 assignments due per 8:** Engineering requirements list Morph chart
3	7, M, 9/15 8, W, 9/17 9, F, 9/19	**4.Detailed design** Analysis and modelling **5.Document and communicate** Writing standards Technical sketching Introduction to project management	**All wk 3 assignments due per 11:** Codes and standards assignment Modeling Team charter
4	10, M, 9/22 11, W, 9/24 12, F, 9/26	**Project 2** Form teams **Project management** Work breakdown structure Scheduling **5.Document and communicate** Writing standards **1.Problem definition** Review previous problem formulation Objectives – pairwise comparison Review of Google Drawing software	**Project 1 deliverables due today** **All wk 4 assignments due per 14:** Team charter Work breakdown structure Gantt chart Objectives - pairwise comparison chart, and objective metrics Constraints Table **Project 2 deliverables due per 22**
5	13, M, 9/29 14, W, 10/1 15, F, 10/3	Linear responsibility chart **2.Research and requirements** Review -- problem research Review -- design requirements **3.Generating options** Review - Design space Concept Map	**All wk 5 assignments due per 17:** Linear responsibility chart Engineering requirements Morph chart Concept map (hand)
6	16, M, 10/6 17, W, 10/8 18. F, 10/10	**4.Detailed design** Prototyping and testing Engineering economics	**All wk 6 assignments due per 20:** Engineering economics(hand written)

7	19. M, 10/13 20. W, 10/15 21. F, 10/17	Engineering Economics **5.Document and communicate** Engineering drawings CAD Powerpoint report format	**All wk 7 assignments due per 23:** Engineering economics Prototype demos
8	22. M, 10/20 23. W, 10/22 24. F, 10/24	**Project 3 – Introduction** **Project Management** (review) **Project Management -** Percent compl. matrix **Step 1.Problem definition** - review prob stmt, objectives tree, pair-wise comparison chart and objective metrics	**Project 2 deliverables due today** **All week 8 assignments due per 26:** Team charter Revised problem statement with objectives list, objective metrics and constraints list WBS, LRC, Gantt chart **Project 3 deliverables due per 42**
9	25. M, 10/27 26. W, 10/29 27. F, 10/31	**Step 2.Research and establish requirements** Engineering standards Design requirements (review) Quantifying requirements – requirement table	**All wk 9 assignments due on per 29:** Pairwise comparison chart Percent completion matrix updated weekly Requirements table and written specification
10	28. M, 11/3 29. W, 11/5 30. F, 11/7	**3.Generating options** Systematic design Ideas - patents Review morph chart Review Precedence Down selection - review numerical evaluation method	**All wk 10 assignments due per 32:** Morph chart Numerical evaluation matrix
11	31. M, 11/10 32. W, 11/12 33. F, 11/14	**4.Detailed design** Engineering calculations and modeling **5.Document and communicate** How to make a technical presentations Engineering specifications PDR presentations	**All week 11 assignments due per 35:** System level diagram with interactions Computer model of essential mechanism
12	34. M, 11/17 35. W, 11/19 36. F, 11/21	PDR presentations Design for sustainability Exam 1	Demonstrate working prototype
Thanksgiving Break 11/24-28			
13	37. M, 12/1 38. W, 12/3 39. F, 12/5	Total life cycle analysis Ethics and the engineering profession	To be added
14	40. M, 12/8 41. W, 12/10 42. F, 12/12	Ethics and safety in engineering	To be added **Project 3 deliverables due per 42**
15	Final Exam	Section 1: T, 12/16, 7:30-9:30 Section 2: R, 12/18, 7:30-9:30 Section 3: W, 12/17, 9:45-11:45	

Requirements on Assignments and other course work. Calculations, spreadsheet and written material must use the proper engineering format and/or meets the engineering program writing quality expectations (see program writing text book).