IT 112.01,02E – Product Design & Development
Course Syllabus
Ag/IT 118A
Spring 2015

Instructor: Mr. Perry Moler
Instructor
Department of Engineering & Technology

Office Location: Charles J. Austin Engineering & Technology Building, Room 219

Office Hours: M,W,R 9-10 a.m. F 9-11a.m. or by appointment

Office Phone: 903-886-5361

Office Fax: 903-886-5960

University Email Address: Perry.Moler@tamuc.edu

COURSE INFORMATION

Materials – Textbooks, Readings, Supplementary Readings:

Textbook(s) Required: Planchard, D. C. and Planchard, M. P., (2013). *Engineering design with SolidWorks 2014: A step-by-step project based approach utilizing 3D solid modeling,* Schroff Development Corporation, Mission, Kansas. ISBN 978-1-58503-848-0.

Required Materials:

1) Bound notebook, such as a composition notebook (Available at the A&M-Commerce bookstore or any office supply store)
2) Scientific calculator
3) Memory stick or portable storage device

Course Description:

Product development and design processes and methods, including product specifications, concept development, engineering drawings, design for prototyping, and manufacturing. Prerequisite IT 111 or the equivalent.

Student Learning Outcomes:

Upon satisfactory completion of the course, the student will be able to:

1. Describe an engineering design and development process
2. Create 3D solid models of mechanical components using CAD software
3. Demonstrate individual skill using selected manufacturing techniques, including drilling, pressing, tapping, and rapid prototyping

4. Employ engineering, scientific, and mathematical principles to execute a design from concept to finished product
5. Fabricate an electromechanical assembly from engineering drawings
6. Work collaboratively on a team to successfully complete a design project
7. Effectively communicate the results of projects and other assignments in a written and oral format

Units of Study

Module 1

- Introduction to product design and development
- Fundamentals of 3D modeling
- Basic manufacturing processes

Module 2

- Engineering design
- Proof of concept
- Rapid prototyping

Module 3

- Assembly model
- Assembly drawing
- Manufacturing process plan
- Electromechanical assembly
- Test and troubleshoot electromechanical system

COURSE REQUIREMENTS

Instructional / Methods / Activities Assessments

This is a project-based course and will be presented using formats that include lectures, discussions, laboratory work, and/or group participation. Student participation and interaction is required.

Homework/Class Assignments: 20% of total course grade

Student Learning Outcomes #2, #3, #4

Problems from the textbook or other resources will be assigned to support the instructional material. Students will apply theory and mathematical principles to solve applied engineering problems.

Assessment Method: Points will be allocated to each homework / classroom assignment. The total points per assignment will be based upon the number and complexity of the problems. Assignments will be graded both for accuracy as well as demonstrated knowledge of the topic being addressed. Students may work in groups to complete assignments unless otherwise specified by the instructor.

Laboratories / Engineering Notebook: 70% of total course grade

Student Learning Outcomes #1, #2, #3, #4, #5, #6, #7

Student teams will develop, design, manufacture, and test an electromechanical system (water pump). Hands-on experiences in the interpretation of product/customer specifications, concept development, engineering drawings, design for prototyping, and manufacturing will be utilized in the instruction of the engineering design process. Students will accurately document their product design experience through an engineering notebook.

Assessment Method: The student design project will be broken into three modules. Points will be allocated to each module based upon the complexity of the exercise. The total points will include the required documentation in an engineering notebook.

Module 1: 20%

- *Introduction to product design and development*
- *Fundamentals of 3D modeling*
- *Basic manufacturing processes*

Module 2: 20%

- *Engineering design process*
- *Proof of concept*
- *Prototyping*

Module 3: 30%

- *Assembly modeling*
- *Assembly drawings*
- *Manufacturing process plan*
- *Final assembly*
- *Testing and troubleshooting*

Laboratory work will be graded both for accuracy as well as demonstrated knowledge of the topic being addressed. Students will work in groups of two or three to develop teamwork skills. Each group will keep an accurate record of the design project in an engineering notebook. The notebook must be bound with page numbers. The notebook should be used to record key meetings as well as ideas, results, observations, references, and any other information related to a project. This includes all design ideas and tests, whether they were successfully implemented or not.

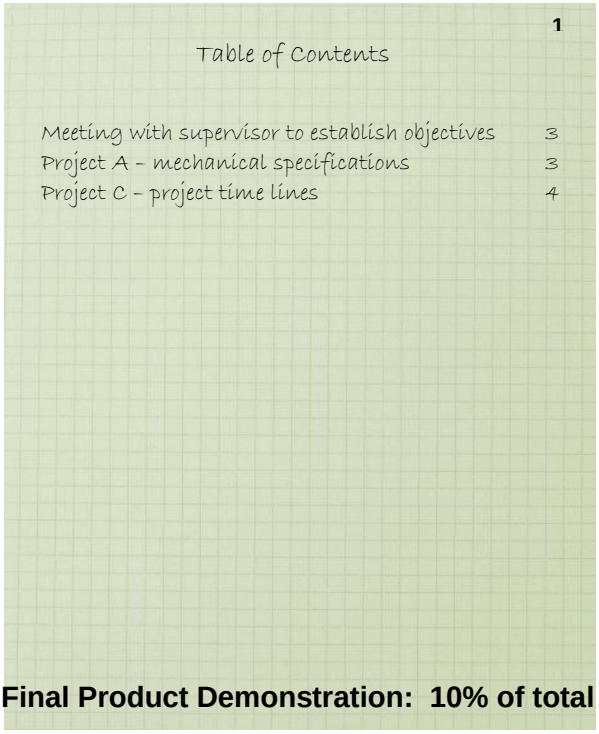
Sufficient detail should be included, which would allow someone to replicate the design and/or project with limited or no prior knowledge of the project.

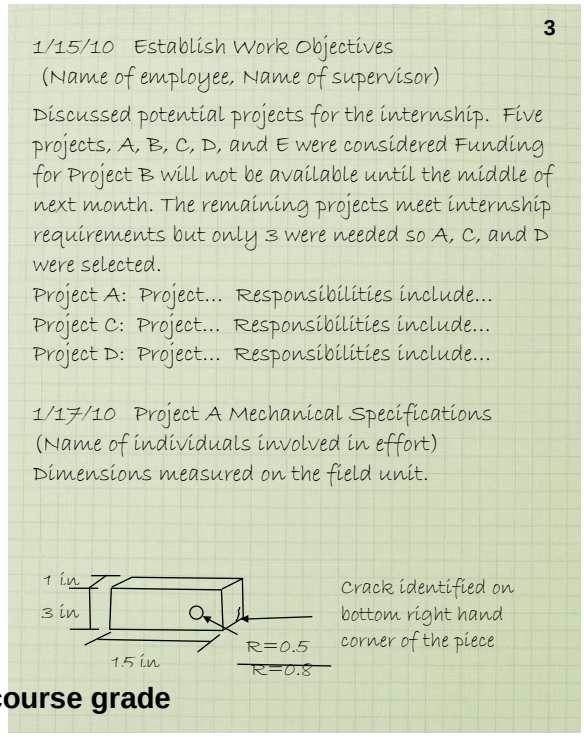
Key Guidelines:

- Entries should be legible and made in ink.
- Entries should be made at the time the work is completed rather than taking notes on scratch paper and transferring it at a later time.
- The first few pages should be reserved for the Table of Contents. The description title and associated page number should be included separately for each entry made in the notebook. Ensure the title of the entry is used in the Table of Contents.
- Date each entry in the notebook.
- Title each entry so it can be easily associated with a given project.

- For every entry, list each person who participated in the meeting, test, or effort being documented. Ideally, each lab partner will initial and date following each entry but this is not required as long as the individuals are clearly identified.
- Include all design iterations and tests, whether they were successfully implemented or not. The notebook should be a history of the project not just a report on the characteristics of the final product.
- Include descriptions of the equipment and/or software used in tests and/or analyses. Software versions are critical as later versions may or may not perform in the exact same manner.
- Line out errors, never erase.
- Include graphics, schematics, and tables as appropriate.

A format similar to the one shown in the following examples should be used for the Table of Contents and journal entries, unless otherwise specified by the instructor. The examples are intended to represent two random pages out of a notebook.





Final Product Demonstration: 10% of total course grade

<u>Student Learning Outcome #1, #4, #5, #6, #7</u>

The final demonstration will include two elements: 1) an oral presentation 2) functional demonstration of the electromechanical system operation.

<u>Assessment Method:</u> Each portion of the final demonstration will be worth 50 points. The oral presentation will be treated as the final design review for a customer with the grade based upon organization, technical content, time management, and basic presentation skills. The functional demonstration will verify the electromechanical system meets customer specifications. The grade will be based upon documented design specifications and pump performance.

Grading

The ***final course grade*** will be based upon the following:

Assessments		Grading Scale	
Homework/Quizzes	**20%**	90 – 100	A
Module 1	**20%**	80 – 89	B
- *Top/bottom plate solid model (5%)*		70 – 79	C
- *Top/bottom plate drawing. (5%)*		60 – 69	D
- *Plate manufacturing (5%)*		<59	F
- *Engineering notebook (5%)*			
Module 2	**20%**		
- *Impeller solid model (3%)*			
- *Impeller mfg. drawing (5%)*			
- *DC Motor solid model (3%)*			
- *DC Motor drawing (5%)*			
- *Engineering notebook (4%)*			
Module 3	**30%**		
- *Assembly solid model (5%)*			
- *Assembly drawing w/parts list (10%)*			
- *Mfg. process plan (10%)*			
- *Engineering notebook (5%)*			
Final product demonstration	**10%**		

Participation

Attendance is a vital part of this project-based course. A point deduction will be assessed to the final grade average based on the following number of absences:

0-1 absences	0 pt deduction
2 absences	2 pt deduction
3 absences	5 pt deduction
4 absences	10 pt deduction
5 or more	20 pt deduction

In rare cases there may be special circumstances that justifies an excused absence. The instructor has the final decision on whether an absence is excused or not. Contact the instructor if you know that you will be absent.

Late work will not be accepted and a grade of "0" will be assigned, unless prior arrangements are worked out with the instructor. The instructor has the final decision on whether late work will be accepted. Late penalties will be assessed to any approved late work.

TECHNOLOGY REQUIREMENTS

The following technologies will be required for this course.

- Internet access / connection
- Microsoft Word
- Microsoft Excel
- Microsoft PowerPoint

The following technologies will be provided and utilized in the course.

- SolidWorks
- MultiSIM
- Prototype machines

- Manual manufacturing tools
- Basic hand tools

COMMUNICATION AND SUPPORT

Interaction with Instructor Statement:

Outside of the classroom, email will be the primary communication tool. Students should communicate with the instructor via email at the address provided in this syllabus. The instructor will communicate with students via email through their myLeo email address.

COURSE AND UNIVERSITY PROCEDURES/POLICIES

Course Specific Procedures:

Academic Dishonesty

Texas A&M University-Commerce will not condone plagiarism in any form. Plagiarism represents disregard for academic standards and is strictly against University policy. Plagiarized work can result in a "0" on a given assignment(s) or an "F" for the course as well as further administrative sanctions permitted under University policy. You may discuss course work and other course materials with fellow students (except during tests), but it is inappropriate to have another student do your course work or provide you with any portion of it.

Guidelines for properly quoting someone else's writings and the proper citing of sources can be found in the APA Publication Manual. If you do not understand the term "plagiarism", or if you have difficulty summarizing or documenting sources, contact your professor for assistance.

University Specific Procedures:

Students with Disabilities

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you have a disability requiring an accommodation, please contact:

Office of Student Disability Resources and Services
Texas A&M University-Commerce
Gee Library, Room 132
Phone (903) 886-5150 or (903) 886-5835
Fax (903) 468-8148
StudentDisabilityServices@tamuc.edu

Student Conduct

All students enrolled at the University shall follow the tenets of common decency and acceptable behavior conducive to a positive learning environment. (See *Code of Student Conduct from the Student Guide Handbook).*

Students are expected to attend all class periods and to be prepared for each class. Students are expected to refrain from any disruptive behaviors during class, which includes but is not limited to working on assignments/projects from another course,

reading non-course materials, or using the computer for non-class purposes. Cell phones and other electronic devices should be turned off during class.

Non-Discrimination Statement

A&M-Commerce will comply in the classroom, and in online courses, with all federal and state laws prohibiting discrimination and related retaliation on the basis of race, color, religion, sex, national origin, disability, age, genetic information or veteran status. Further, an environment free from discrimination on the basis of sexual orientation, gender identity, or gender expression will be maintained.

COURSE OUTLINE / CALENDAR

	Topic	Assignment(s)
Week 1	**Module 1** - Course introduction - Engineering notebooks/documentation - Shop safety	Reading:Safety information Lab:MSDS Lab Assignment: Safety quiz
Week 2	- Overview of engineering design process - Overview of manufacturing fundamentals - Electrical fundamentals	Reading: Lab: Assignment: Ohm's Law HW, Electrical Fundamentals HW
Week 3	- Fundamentals of 3D modeling	Reading: Project 1 Chapter Lab: Project 1 tutorial Assignment:
Week 4	- Fundamentals of 3D modeling - Formatting drawing sheets	Reading: Project 1 Chapter Lab: Project 1 tutorial Assignment:
Week 5	- Component development from customer specifications - Basic manufacturing processes	Reading: Lab: Top plate, bottom plate, bushing drawings; mfg top & bottom plate Assignment:
Week 6	**Module 2** - DC motors - Modeling existing components	Reading: Lab: DC Motor 3D model and part drawing Assignment: DC motor HW
Week 7	- Development of a product concept	Reading: Research impeller designs Lab: Impeller 3D conceptual model Assignment: Hand drawn sketch of impeller concept Project 2 tutorial
Week 8	- Proof of concept	Reading: Project 2 chapter Lab: Impeller prototype; fit test Assignment: Project 2 tutorial
Week 9	- New product design and development from conceptual model - Product manufacturing	Reading: Project 2 chapter Lab: Production impeller; drawings Assignment: Project 2 tutorial

Week10	- Rapid prototyping - Product test	Reading: Project 2 chapter Lab: Functional test motor/impeller assembly Assignment: Project 2 tutorial 3D model + Quiz
Week 11	**Module 3** - Component sourcing - Final assembly	Reading: Component Sourcing Handout Lab: Drawings - screws, o-rings, & threaded fittings drawings Assignment:
Week 12	- Assembly modeling - Assembly testing	Reading: Project 3 chapter – Exploded View – Bill of Materials Lab: Pump 3D assembly model Assignment: Portion of project tutorial 3
Week 13	- Assembly drawing with bill of materials - Assembly testing	Reading: Project 3 chapter – Exploded View – Bill of Materials Lab: Pump assembly drawing Assignment: Portion of project tutorial 3
Week 14	- Final product testing - Manufacturing Process plan	Reading: Project 3 chapter – Exploded View – Bill of Materials Lab: Pump assembly; Manufacturing process plan for pump assembly Assignment: Portion of project tutorial 3
Week 15	- Final project demonstration – Oral Presentations	Reading: Lab: Assignment:
Week 16	**Final**	Functional project demonstration