

COURSE OUTLINE

Engineering 112
Advanced SolidWorks Applications

I. Catalog Statement

Engineering 112 teaches the advanced concepts of the SolidWorks software, its use as a mechanical engineering design and manufacturing tool, and the ability to fabricate, design, and create parts and assemblies. Topics include mechanical design modeling in the 3D environment, complex solid and surface modeling, digital input and output, analysis, and integrating SolidWorks with other Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) programs for a productive design workflow.

Units – 3.0

Lecture Hours – 2.0

Total Laboratory Hours – 4.0

(Faculty Laboratory Hours – 4.0 + Student Laboratory Hours – 0.0 = 4.0 Total Laboratory Hours)

Prerequisite course: Engineering 111 or equivalent.

II. Course Entry Expectations

Skills Level Ranges: Reading 5; Writing 5; Listening/Speaking 5; Math 3.

Prior to enrolling in the course, the student should be able to:

1. complete a series of problems demonstrating basic knowledge and skills in utilizing the SolidWorks software.
2. acquire a basic knowledge of computer aided design (CAD) by completing a series of engineering drafting and design documents.
3. utilize the SolidWorks software system to complete a series of basic design problems.
4. exhibit a working knowledge of the SolidWorks software commands through the completion of comprehensive mechanical design problems.

III. Course Exit Standards

Upon successful completion of the required coursework, the student will be able to:

1. navigate the SolidWorks interface;
2. create mechanical engineering and manufacturing design components and assemblies in a 3D environment;
3. create 2D representational drawings from 3D models;

4. prepare models to be digitally fabricated with CAM and Computer Numerical Control (CNC);
5. utilize lofting and surfacing tools in SolidWorks to create complex parts.

IV. <u>Course Content</u>	Total Contact Hours = 96
A. User Interface	6 Hours
1. Menus and toolbars	
2. Model preparation	
3. Viewport navigation	
4. Application settings	
5. Reference planes	
6. 2D and 3D sketch and features	
B. 3D Sketch	6 Hours
1. Adding 3D lines	
2. Creating sweep profiles	
3. Understanding 3D sketch and planes	
4. Working with composite curves	
C. Plane Creation	6 Hours
1. Sketching the base profile	
2. Showing a sketch	
3. Creating various new work planes	
D. Advanced modeling	6 Hours
1. Creating a transition body	
2. Constructing new work planes	
3. Extruding text and other information	
4. The parametric tree and history	
E. Sweep with a composite curve	6 Hours
1. Creating the sweep path	
2. Creating the sweep profile	
3. Define and create a helix	
4. Combining sketches using composite curves	
F. Advanced modeling - sweep versus lofting	6 Hours
1. Applying draft options	
2. Choosing between sweep and loft	
G. Lofts	6 Hours
1. Create loft profiles	
2. Create solid loft features	
H. Loft with guide curves	6 hours
1. Creating a curve through reference points	
2. Construct the loft sections	
3. Create a loft feature.	
I. Lofted Surface	6 hours
1. Creating offset distance planes	
2. Splitting, deleting, and thickening surfaces	
3. Calculating the angle between faces	

J. Advanced surfaces	6 hours
1. Using offset and ruled surfaces	
2. Using the splitting lines	
3. Using offset, ruled, and knit surfaces	
K. Surfaces versus solid modeling	6 hours
1. Sketching the sweep path and profile	
2. Knitting surface bodies	
3. Advantages and disadvantages of solids versus surfaces	
L. Simulation	6 hours
1. Setting up units	
2. Adding a fixture and loads	
3. Material selection	
4. Analyzing the model	
M. Top-down tooling assembly	6 hours
1. Creating radiate surfaces	
2. Adding parts into an assembly document	
3. Opening an Initial Graphics Exchange Specification (IGES) file	
N. Assemblies	6 hours
1. Inserting parts into an assembly	
2. Making an assembly section view	
3. Adding sub-components	
O. External references and repairing errors	6 hours
1. Interpreting external reference symbols	
2. Repairing and or replacing relations and dimensions	
P. Printing, plotting, and final test	6 hours

V. **Methods of Presentation**

The following instruction methodologies may be used in the course:

- a. lecture;
- b. multimedia;
- c. guest speakers;
- d. field trips.

VI. **Assignments and Methods of Evaluation**

1. Performance tests and quizzes.
2. Self-paced tutorials (e.g. tutorials consisting of instructions to complete various components of a engineering mechanical design and assemblies).
3. Midterm examination.
4. Individual projects (e.g. Projects consist of detail parts and assemblies of the components completed as part of the self-paced tutorials and other in-class assignments).
5. Final examination.

VII. Textbook

Tran, P., SolidWorks 2010 Part II – Advanced Techniques, Current edition.

Mission: Schroff Development Corporation, 2009.

10th Grade Textbook Reading Level. ISBN: 978-1-58503-578-6.

VIII. Student Learning Outcomes

1. Students will apply the various tools in the SolidWorks software program to complete advanced tasks for mechanical engineering design projects.
2. Students will produce components from various engineering and manufacturing designs to create mechanical engineering projects.
3. Students will complete conceptual and production models of mechanical engineering design and manufacturing projects and the working drawings of for an engineering project.