# Part 1: Course Information

## Course Overview

### Basic Information

College:   
Department:  
Semester:   
Instructor:   
Office:   
Office Hours:   
Office Telephone:   
Email:

### Description

Drafting is a survey course that covers CAD modeling and drafting techniques specific to mechatronic systems. This course consists of 15 lessons along with corresponding labs and/or class activities. Topics covered include sketching techniques, multi-view drawings, dimensioning, solid-modeling techniques, documentation drawings, file management, drawing standards, and assemblies. The course embeds preparation for the SolidWorks Associate (CSWA) exam, and culminates in a mechatronic-specific CAD project.

### Prerequisites

No Mechatronics courses are required as prerequisites.

To succeed in this course, students should be proficient in English and basic Algebra.

## Course Materials

### Recommended Textbook(s)

Giesecke, F., Mitchell, A., Spencer, F., Hill, I., Dygdon, J., Novak, J., & Lockhart, S. (2009). *Modern Graphics Communication* (4th ed.). San Francisco, CA: Peachpit Press. ISBN-13: 978-0135151037.

Lockhart, S.E. & Johnson, C. (2011). *Engineering Design Communications: Conveying Design Through Graphics* (2nd ed.). San Francisco, CA: Peachpit Press. ISBN-13**:** 978-0137057146.

### Recommended Software-Specific, Tutorial-Style Textbook(s)

Shih, R. (2014). *Learning Autodesk Inventor 2014.* Mission, KS: SDC Publications. ISBN-13: 978-1585037964.

Tran, P. (2014). *SolidWorks 2014 Part 1 – Basic Tools.* Mission, KS: SDC Publications. ISBN-13: 978-1585038534.

Note: The suggested text will depend on the software that is used by your college. Whatever the software used, it is recommended that each student have both a drafting reference textbook and a tutorial-style textbook.

## Course Structure

This course is designed to provide a hybrid experience, including both face-to-face and online activities. Activities to be completed online and face-to-face will be updated weekly and provided as a supplement to the course syllabus.

Contact time will be divided in the following way:

80% face-to-face  
20% online

### Face-to-face sessions

Laboratory exercises and in-class work will emphasize skill attainment and content mastery.

### Online Sessions

Online sessions will include content and activities from Platform +, Wisc-Online, Tooling U, simulated lab activities, and other resources. To access online activities, students will need access to the Internet and a supported Web browser. Technical assistance can be obtained from local technical support.

### Technical Requirements

* Internet connection
* Access to college learning management system and Platform+.
* Access to college email account
* Microsoft PowerPoint
* Microsoft Word

# Part 2: Learning Outcomes

Following successful completion of the Electrical Systems course, the student will be able to:

**Applied Mathematics**

* Use basic arithmetic, geometry, and trigonometry to solve 2D CAD geometry.

### Creative Thinking/Problem Solving

* Apply freehand sketching techniques to mechanical parts/blocks to create multi-view drawings.
* Interpret engineering line types, as well as drawings that include sectional views.
* Create detailed drawings using a drawing template, as well as an exploded assembly drawing.
* Create a professional engineering drawing using CAD.

### Equipment

* Use Vernier calipers to accurately measure objects.
* Use a variety of machine shop tools, such as centerpunches, bench-drills, drill sets, fractional tap-sets, and vises, to drill and tap aluminum.

### Foundational Principles

* Describe the different types of engineering drawings and models.
* Describe various freehand sketching and caliper measurement techniques.
* Explain the differences between third-angle projection and first-angle projection.
* Differentiate among types of section views and identify the main types of mechanical holes.
* Identify features of CAD software and how they should be evaluated when selecting a program, and identify common applications for CAD in different areas of drafting.
* Explain and apply concepts and sketch modification techniques in 2D geometry and 3D modeling.

**Technical Literacy**

* Read, analyze, and use utilize engineering graphics, technical drawings and blueprints.

# Part 3: Course Calendar

This course calendar provides a schedule of lessons and an outline of topics covered. Activities, assignments, and assessments will be explained in detail throughout the course. Please contact the instructor with questions.

## Lesson 1: Overview Date

1. Class syllabus, Course Policies and Procedures
2. Introduction to Engineering Graphics
3. Types of Engineering Drawings
4. Quick Hand Sketch
5. Detail Part Drawing
6. Assembly/Exploded Assembly Drawing
7. Rendered 3D CAD Model
8. Models/Prototypes
9. Drafting and Design Careers
10. Detail Drafter
11. Layout Drafter
12. Design Drafter
13. Technical Illustrator
14. Architect
15. Mechanical Engineer
16. Electrical Engineer
17. Manufacturing Engineer
18. Civil Engineer

## Lesson 2: Sketching and Measurement Date

1. Lab Activity: Techniques in Freehand Sketching
2. Drawing a Straight Line
3. Drawing an Angled Line
4. Drawing Curves and Circles
5. Proportions and Scale
6. Lab Activity: Measuring Objects Using Vernier Calipers
7. Caliper Units
8. Dial Versus Digital Calipers
9. Inside and Outside Jaw Measurements
10. Depth Measurements

## Lesson 3: Multi-View Drawings Date

1. Multi-View Drawings/Orthographic Projection
2. Front, Plan, and Side Views
3. Choosing the Best Front View
4. Glass Box Approach
5. Lab Activity: Multi-View Drawing Practice Using Plastic Blocks
6. Applying Dimensions to Drawings
7. Parts of a Dimension
8. Units/Precision
9. Linear Dimensions, Aligned Dimensions, Angular Dimensions, Radius/Diameter Dimensions
10. Dimensioning Guidelines
11. Lab Activity: Dimensioning Exercises

## Lesson 4: Sectional Views and Mechanical Holes Date

1. Sectional Views
2. Overview
3. Cutting Plane
4. Full, Half, Offset, Broken-Out Sections
5. Hatching
6. Lab Activity: Creating a Sectional View
7. Lab Activity: Mechanical Holes
8. Through Hole
9. Countersink
10. Counterbore
11. Threaded Holes

## Lesson 5: CAD Overview Date

1. Introduction to Computer-Aided Design (CAD)
2. What is CAD?
3. Typed of Drawings That Can Be Completed Using CAD
4. Reasons for Using CAD?
5. Comparison of Different Mainstream CAD Programs
6. AutoCAD
7. Autodesk Inventor
8. SolidWorks
9. Pro-Engineer
10. Revit
11. Lab Activity: Introduction to SolidWorks Use Interface
12. SolidWorks User Interface
13. SolidWorks Systems Options
14. Importance of Good File Management Techniques
15. Part, Assembly, Drawing Files
16. Downloading and Installing Student Version of SolidWorks

## Lesson 6: 2D Sketching in SolidWorks Date

1. Lab Activity: Creating 2D Sketch Geometry in SolidWorks
2. Introduction to 2D Sketching
3. Drawing Lines, Circles, Centerlines, and Other 2D Sketch Geometry
4. Reference Planes
5. Snapping to Lines and Points
6. Selection Boxes: Blue Vs. Green
7. Applying Dimensions to Sketches
8. Lab Activity: Adding Dimensions and Constraints to the Geometry
9. Types of Geometric Relations
10. Adding Geometric Relations to Sketches

## Lesson 7: Sketch Modification Techniques Date

1. Lab Activity: Modifying Existing 2D Sketch Geometry in SolidWorks
2. Fillet
3. Trim
4. Mirror
5. Offset
6. Linear and Circular Patterns
7. Lab Activity: Basic 3D Modeling Techniques
8. Base/Boss Extrudes
9. Cut Extrudes
10. Revolved Features

## Lesson 8: 3D Modeling Date

1. Lab Activity: Creating 3D Solid Models - Extruding
2. How to Use the Feature Tree
3. Controlling Sketch Visibility
4. Editing Existing Sketches and Features
5. Logical Steps in Creating a 3D Model
6. Calculating the Mass Properties of the Part
7. Lab Activity: Creating Revolved Solid Models
8. Continuous Closed Region
9. Mirror Feature
10. Derived/Underived Sketches

## Lesson 9: Advanced 3D Modeling Features Date

1. Lab Activity: Creating 3D Solid Models - Extruding
2. What are Ribs and How are They Created in CAD?
3. Draft Extrusions
4. What is the Shell Feature and How Is It Created in CAD?
5. Lab Activity: Solid-Modeling Pattern Techniques
6. Linear Patterns
7. Circular Patterns
8. Curve Driven Patterns

## Lesson 10: CAD Drawing Template Date

1. Lab Activity: Creating a SolidWorks Drawing Template

## Lesson 11: Engineering CAD Drawings I Date

1. Lab Activity: Adding Drawing Views to an Engineering Drawing
2. Orthographic views (Front, Top, Right)
3. Isometric Views
4. Section, Detail & Auxiliary views
5. Cross-Hatch patterns
6. Changing views from Wireframe, Solid to Shaded.
7. Controlling the Drawing view scale
8. Creating projected views

## Lesson 12: Engineering CAD Drawings II Date

1. Lab Activity: Adding Dimensions and Other Annotations to Drawings
2. Creating Smart Dimensions
3. Creating Horizontal and Vertical Dimensions
4. Baseline Versus Ordinate Dimensions
5. Controlling the Size of the Dimensions Text, Lines, and Arrows.

## Lesson 13: Assemblies and Exploded Assemblies I Date

1. Lab Activity: Creating Assemblies in SolidWorks
2. Degrees of Freedom
3. Assembly Mates: Coincident, Concentric, Parallel, Perpendicular, Tangent
4. Editing Existing Mates
5. Using the Top, Right, and Front Planes in Mating

## Lesson 14: Assemblies and Exploded Assemblies II Date

1. Lab Activity: Exploded Assemblies and Mechanical Hardware
2. Exploding an Existing Assembly in SolidWorks.
3. Adding the Exploded Assembly to the Drawing.
4. Adding a Bill of Materials.
5. Modifying a Bill of Materials.
6. Creating Balloon Callouts on the Drawing.
7. Exploding and Collapsing an Assembly

## Lesson 15: CSWA Certification Preparation Date

1. Preparing for the SolidWorks Associate (CSWA) Certification
2. Final Design Project(s) Due

# Part 4: Grading Information

## Graded Activities

### Final Design Project

There will be a final design project worth 50% of the final grade.

### Laboratory Exercises

Laboratory exercises measure skills and abilities relating to knowledge learned in class and will be worth 30% of the final grade.

### Homework

Doing work outside of class is critical to success. Homework is graded and will be worth 10% of the final grade.

### Class Participation

Class participation is important and will be worth 10% of the final grade.

## Grading Breakdown

Final Design Project = 50%  
Laboratory Exercises = 30%

Homework = 10%  
Class Participation = 10%

## Grading Scale

A = 90-100   
B = 80-89   
C = 70-79   
D = 60-69   
F = 59 and below

## Late Work

Late work will not be accepted unless it is pre-approved by the instructor. All graded work will be posted in the college learning management system with 48 hours of due date.

# Part 5: College Policies and Resources

## Policies

### Attendance

### Academic Integrity

### Campus Civility

## Resources

### ****Counseling****

### ****Veterans****

### ****Students with Disabilities****

# About These Materials

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