



Course Syllabus

Course #: CAD 1320 Course Name: CAD Solid Modeling

Division: Engineering and Industrial Technologies

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Class Days: Class Time:
Location: Classroom: E214 Laboratory:
Credit Hours: 3 Contact Hours: Lab Hours: 2 Lecture Hours: 2

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Course Description: A study of popular parametric and adaptive solid modeling systems used in the computer aided design industry. Autodesk Inventor is used for modeling and assembly production as well as Solid model analysis. Models will be produced and modified as both 3D models and 2D orthographic presentations.

Prerequisite(s): CAD 1110 (or by permission of the instructor)

Corequisite(s): None

Entry Level Skills and Knowledge: Basic CAD

Required Texts, Supplies and Equipment: Inventor Visual Fast Start, Prentice-Hall

Grading:

- 90 - 100 = A
80 - 89 = B
70 - 79 = C
60 - 69 = D
Below 60 = F

Learning Outcomes:

General Education

- 1. Communicate effectively
2. Evaluate arguments in a logical fashion—Competence in analysis and logical argument are explicit learning goals for most general education programs, although these skills go by a variety of names (e.g., critical thinking, analysis, logical thinking, etc.). Students will be able

**to demonstrate competence in problem solving in communication, mathematics, and in team settings.**

- 3. Employ the methods of inquiry characteristic of natural sciences, social sciences, mathematics, and the arts and humanities;** general education introduces students to methods of inquiry in several fields of study and thereby prepares students to integrate information from different disciplines.

**Assessment of Student Learning:** *This is “Project” based course. Each drawing project is treated like a quiz. Projects are averaged for a final course grade. The list of required projects is given in the “Plan of Work” section of this syllabus.*

**Assessment Project and Measurement in course (if any):** *See 3D proficiency topic list in the Terra CAD proficiency test document.*

## **Plan of Work:**

### **Week 1**

#### **3D Parametric Modeling**

##### **Using Inventor**

##### **A Quick History of 3D Computer Aided Design**

- Surface & Solid Modeling
- Parametric Models
- Adaptive Modeling
- Types of Inventor files,
- Part Files (.IPT)
- Assembly Files (.IAM)
- Drawings Files (.IDW)
- Presentation Files (.IPN)
- Project file Structure
- Workspace files
- Work Groups
- Library files

##### **Starting Inventor**

- Steps 1 through 7 for starting Inventor

##### **The Inventor Design Process**

- Sketching
- Constraining
- Converting
- Refining
- Assembly
- Orthographics & Drawings
- Presentation & animation

**Projects:** (Inventors Capabilities follow steps 1 through 100)

### **Week 2**

#### **Sketching and Constraining**

##### **Methods of Sketching**

- Introduction to the Sketch Mode
- Creating the sketches

##### **Methods of Constraining**

- Constraining

- Constraining with dimensions
- Modifying while creating sketches

**Projects:**

- Hole Block
- Head Gasket

**Week 3**

**3D Features**

**Extrude Features**

- Join features
- Cut Features
- Intersect Feature
- Taper Angle
- Solid or Surface
- Fillets & Chamfers in the Feature Mode
- Adding Hole features

**Viewing models**

- 3D viewing

**Working on selected faces and planes**

- Creating New Sketch Planes
- Creating Work Planes
- **Holes in the Feature mode**

**Projects:**

- Mounting Plate
- Y link
- Valve Handle
- Water Manifold
- Caps drawing

**Week 4**

***Revolve, Sweep & Loft Features***

**Revolve Feature**

- Degrees
- Join features
- Cut Features
- Intersect Feature
- Surface or Solid

**Sweep Feature**

- Rules for Creating sweep path
- Creating sweep profiles

**Loft Feature**

- Creating the offset work planes
- Creating profiles

**Projects:**

- Wheel Hub
- Injector Nozzle
- Tire drawing
- Lift Handle
- Loft arm
- Die Mold

**Week 5**

***Shell & Coil Features***

**Shell Feature**

- Removing faces

- Setting wall thicknesses
- Inside, Outside & both

#### **Coil Feature**

- Creating 3D coils & springs
- Sketching & constraining coil profile and coil center

#### **Rib Feature**

- Adding Ribs & Splits

#### **Adding Threads**

- ANSI, ISO & Metric threads
- Size, pitch & angle options

#### **Editing Part features and sketches**

- Editing Features
- Editing Sketches

#### **Projects:**

- Piston
- Oil Pan

### ***Week 6***

#### ***Special Shape Creation Techniques***

#### ***Using Surfaces and Solids***

#### **Using both Surfaces and Solids**

- Split (split surface)
- Spline lines for cut surfaces
- Using split to create solid faces
- Remove Face
- Surface extrusion
- Angular work plane on surfaces
- Emboss Text

#### **Projects:**

- Plastic Mold Project

### ***Week 7***

#### ***Sheet Metal***

#### **Creating Sheet metal models**

- 3D sheet metal mode
- Flanges, Hem, folds, and other sheet metal commands
- Bends, Holes, corner rounds and other modifying commands
- Unfolding and creating sheet metal drawings

#### **Projects:**

- Computer Box sheet metal design project
- 2 Hole Flange Bracket
- U-Joint

### ***Week 8***

#### ***Orthographic Drawing Production***

#### **Orthographic Drawings**

- Orthographic Drawing production
- Base & Projected views
- View display modification
- Dimensions and Annotations

#### **Projects:**

- Die Practice Project
- Cylinder Head

### ***Week 9***

#### ***Advanced Orthographic Drawing Views***

##### **Advanced Orthographic Drawings**

- Section Views
- Detail Views
- Auxiliary views
- Broken and Break-out Views

##### **Projects:**

- Humvee Lower Front Grill
- Humvee HD Grill
- Gear Axle Bottom Strut
- Landing Gear Hub
- Wheel Assembly
- Cylinder, Shaft and Piston

### ***Week 10***

#### ***Assembly Drawings & Project creation***

##### **Assemblies and Assembly Constraining**

###### **Placing Components**

- Patterning Components
- Move & Rotate individual Component
- Create & Replace Components
- Project Creating

###### **Constraining Components**

- Mate (4 options)
- Angle
- Tangent
- Insert

##### **Projects:**

- Parts for Industrial Robot
- Assemble parts for Robot Gripper
- Rod
- Crank Shaft
- Crank Case
- Engine Assembly
- Valve tester assembly
- Frame design project

### ***Week 11***

#### ***Assembly Presentation, & Analysis***

##### **Assembly Presentation, Motion & Animation**

- Orthographic Projections of Assemblies
- Assembly Bill-of-materials
- Exploded Views
- Assembly Analysis
- For a Deeper Understanding, Assembly Presentations & Analysis

##### **Projects:**

- Engine Presentation Project

### ***Week 12***

#### ***Automated Part Production with Parameters***

### **Automating Part Production with Parameters**

- Adding Parameters & Formulas
- Creating iParts
- Creating iFeatures
- Creating iMates

#### **Projects:**

- Pin Parameters Project

### **Week 13**

#### ***Presenting your Design with the Presentation Mode and Animation***

### **Project mode and Assembly Animation**

- Exploded views and Trails
- Animating the Assembly
- Driving Constraints

#### **Projects:**

- Inventor Design Project

### **Week 14**

#### ***Projects & Engineers Notebook***

### **Drawing Project setup and Invent Project**

- Designing with Inventor
- The Engineers Notebook

#### **Projects:**

- Pressure Vessel Inventors Notebook project

### **Week 15**

#### ***Weldments***

### **Special Weldment Mode**

- Weldment Design and Production

#### **Projects**

- Weldment Cleat Project
- Weldment Tank Project

### **Week 16**

#### ***iPart Factory, iMates, iFeatures, & i-Drop***

- **iPart Factory** flexible part production
- **iMates**
- **iFeatures**
- For Deeper understanding, iPart Factory, iMates, and iFeatures
- Additional Resources for Designers
- Autodesk I-Drop

#### **Project:**

- Design Project

*\* This order may be changed or adjusted to suit individual class needs and software changes.*

### **Course Requirements:**

*Complete all drawing projects as required*

### **Policies**

**Course Withdrawing:** If for any reason you need to withdraw from this course, be certain that you do so according to College procedure. It is your responsibility to know and follow this procedure. If you simply stop coming to class, without officially withdrawing from the course, your grade is an automatic “F.” Please follow official College procedure for withdrawing from this or any course.

*College Academic Policies are located in the College Catalog. A copy of the current catalog may be picked up in any of the division offices or admissions. The list of college policies is also available online at <https://www.terra.edu/register/Collegecat/policies.asp>.*

**Support Services:** The College offers a number of support services to assist in your success in this course and all courses. Among these services are the Writing & Math Center in B105, the Office of Learning Support Services, which coordinates the campus disability services and tutoring programs, the computer labs, and the computers in the atriums.

Any student who feels he/she may need an accommodation based on the documentation of a disability should contact the Office of Learning Support Services privately to discuss his/her specific issues. Please contact the OLSS at (419) 334-8400 X 208 or visit 100 Roy Klay Hall (Building A) to coordinate reasonable accommodations.

*If you have a documented disability and are receiving academic accommodations through the Office of Learning Support Services, please schedule a meeting with your instructor in a timely manner so that we may discuss how these services will be arranged.*

Tutoring services are available to students beginning the second week of every quarter. Students requesting tutoring services should obtain a tutor request form from the OLSS in 100 Roy Klay Hall (Building A) or online at the Terra website. Please note that instructor verification and acceptance of the Student Learner Agreement is necessary for all tutoring requests. All requests should be submitted to 100 Roy Klay Hall (Building A).

**General Education Learning Outcomes:**

4. **Communicate effectively**
5. **Evaluate arguments in a logical fashion**—Competence in analysis and logical argument are explicit learning goals for most general education programs, although these skills go by a variety of names (e.g., critical thinking, analysis, logical thinking, etc.). **Students will be able to demonstrate competence in problem solving in communication, mathematics, and in team settings.**
6. **Demonstrate an understanding of cultural differences and the knowledge of how to work effectively in a global and diverse culture and society.**
7. **Employ the methods of inquiry characteristic of natural sciences, social sciences, mathematics, and the arts and humanities;** general education introduces students to methods of inquiry in several fields of study and thereby prepares students to integrate information from different disciplines.
8. **Engage in our democratic society**—one of the overarching goals of general education is to prepare students to be active and informed citizens; the development of a disposition to participate in and contribute to our democracy is of equal importance to the goal of having the skills to do so intelligently.

Mathematics, and Critical Thinking) and through the e-portfolio (Writing and Cultural Diversity). Outcomes 1 and 2 will also be assessed through course and program assessment for applied degree programs.

**Learning Outcomes 1-5 will be assessed in specific courses included in the Transfer Module.**