



**MFG 119 Manufacturing design and drafting techniques**

**4 Credits**

**College Now/CTE**

**Student Outcomes Checklist**

[cocc.edu/departments/college-now/](http://cocc.edu/departments/college-now/)

**Student's Name** \_\_\_\_\_

**Student's Signature** \_\_\_\_\_ **Completion Date** \_\_\_\_\_

**High School Teacher's Signature** \_\_\_\_\_

**Recommended Grade** \_\_\_\_\_ **High School** \_\_\_\_\_

**CAD software used:** \_\_\_\_\_ **CAM software used:** \_\_\_\_\_

**COCC Review Instructor's Signature** \_\_\_\_\_

**COURSE DESCRIPTION:** Introduction to solid modeling software (computer aided draft) used in design and manufacturing. Includes using the software to capture design intent through part development and to creating assemblies with these parts. Adheres to engineering and manufacturing standards and formats.

**INSTRUCTIONS TO THE TEACHER:** You may access video lectures, student quizzes, tests, PowerPoint slides, the final exam and answer keys through Blackboard. Call the College Now office at 541.504.2930 for access.

**REQUIRED DOCUMENTATION:** When the student has successfully completed all outcomes and tests, the high school teacher will email the following documents to [collegenow@cocc.edu](mailto:collegenow@cocc.edu).

1. The completed student grading sheets detailing the student scores (pages 1, 6 & 7 of this document).
2. The signed final grade roster for the course.

**GRADING:**

A	4.0	Outstanding Performance
A-	3.7	Superior
B+	3.3	Excellent
B	3.0	Very good
B-	2.7	Good
C+	2.3	Better than satisfactory
C	2.0	Satisfactory
D	1.0	Passing (NOTE- DOES NOT COUNT TOWARD MATC GRADUATION)
F	0.0	Not passing

**See Grading Policy at**

[cocc.edu/departments/college-now/forms/files/grading-policy.pdf](http://cocc.edu/departments/college-now/forms/files/grading-policy.pdf)

## **MATC Grading Standards**

### **ASSESSMENT GRADE:**

Portfolio	10%
Cognitive Assessment	40%
Authentic Assessment	<u>50%</u>
<b>TOTAL</b>	<b><u>100%</u></b>

## **COURSE OUTCOMES**

The student will demonstrate how to...

1. Apply engineering and manufacturing standards in the preparation of technical mechanical drawings.
2. Demonstrate basic geometrical relationships; parallelism, perpendicularity, angularity, collinearity and concentricity using standard measurement units used in industry, inches and millimeters, and expression of fractional and decimal values.
3. Model solid objects using standard Computer Aided Design (CAD) software proceeding from basic sketching techniques to the creation of solid features through the use of extrusions, cuts, rotations, patterns and sweeps.
4. Demonstrate a methodical and progressive use of CAD functions to capture the design intent of the solid model and to utilize parametric modeling in the creation of a solid model that can evolve with the design process.
5. Organize and manage part, sub-assembly and assembly properties and relationships within a solid model drawing.
6. Create exploded configurations and animations of solid models with sub-assemblies.

## **REQUIRED ASSIGNMENTS:**

### **Computer Aided Drafting\* performance requirements:**

*\*Note: Use of a specific CAD software is not required to satisfy Manufacturing Technology CAD requirements. Substitution of appropriate menu tasks and drawing functions can be used if no direct correlation exists for the described requirements. If using a 3D solids modeling package as the primary software tool, it may be appropriate for the instructor to rearrange assignments so that the 3D modeling assignment #4 occurs before 2D drawing assignment #3*

### **Assignment #1- Technical Sketches**

- 1) The student will select an appropriate blueprint reading/drafting text from the school library or classroom to complete this assignment.
- 2) The student will select and read the following blueprint/drafting text chapters:
  - **Alphabet of lines:** A chapter dealing with the different types of blueprint lines.
  - **Orthographic projection:** A chapter dealing with different types of views.
  - **Dimensioning:** A chapter that describes how a part is dimensioned properly.
- 3) The student will provide the teacher with evidence of reading the alphabet of lines, part dimensioning techniques, and orthographic projection chapters of the selected reading text. This written evidence can be in the form of a full page typewritten report, a presentation to the class using Power Point that includes graphics, or typed end of chapter questions, depending on the high school teacher's preference.
- 4) The student will prepare three different free hand sketches of items found around the home or school. Each part should be drawn on a separate piece of plain or grid/graph type paper

(not lined notebook paper) and depicted using front, side and top views. Drawings should include approximate dimensions of each object selected. **Use of straight edges, circle templates and other drawing aids are not allowed, and will not be accepted.** This exercise is to develop student skills in determining appropriate object view depiction, view spacing on the paper, a sense of scale and to provide technical sketching practice.

- 5) Turn in your completed sketches and evidence of reading to the teacher for grading.

### **Assignment #2- 2D CAD DRAWING (or Sketching on 3D Solids Modeling Software)**

*Students will need to familiarize themselves with the menu system, drawing tools and procedures needed to operate the CAD system used in this course. This can be accomplished with online or written tutorials, personal exploration of the software or assistance by a peer or teacher. The student, however, must perform the assignment.*

Use a CAD system to locate and draw a dimensioned part using absolute, relative and polar coordinates as required. Suitable drafting projects (that meet your teacher's requirements) might include part features with a bolt circle pattern, clock face, spokes of a wheel and tire, sectional views, or other repetitive drawing entities that require the use of a copy and or array commands.

For 2D CAD systems that provide the functionality, the part should be dimensioned on a separate drawing layer. Evidence of the drawing being on layers can be shown by printing the drawing with and without dimensions or by the teacher directly viewing the drawing layers. For 3D solids CAD systems a screen shot of the sketch showing dimensions is adequate to provide evidence of skill completion.

The drawing used to satisfy assignment #2 will include the student using the following (or similar) menu commands:

- Use Grid and Snap commands during the drawing session
- Use of construction lines / features as necessary
- Use the Array or (copy and rotate) command to draw repetitive radial features
- Use the trim, extend or offset commands to adjust the drawing
- Erase entities and use undo function when necessary
- Layer command: place dimensions on a separate layer in the drawing (if supported)
- Insert a block or stored pattern into the current drawing
- Copy and move an object on the drawing
- Add and edit text used in drawing

### **Assignment #3- 2D CAD Drawing**

Create a CAD software generated multi-view drawing (top, front and side) of an object. Include a title block and drawing frame that contains at the minimum the following information: drawn by, drawing name, approved by, school name (as company), scale of drawing, date and part number or part ID. Templates included with CAD software may be modified as required, or a custom frame can be created. Include within the multi-view drawing the following features:

- A simplified or schematic form of thread depiction (internal or external)
- Angled lines
- A sectional view to improve drawing clarity
- Cross hatch a feature or shape
- A minimum of three differently sized holes
- An elongated slot

The drawing title block should detail the student's name as drawn by. The part number should also be filled in with an appropriate number such as the current date 8232008 for example. Part should be fully dimensioned and ready for release to a hypothetical manufacturing department.

The drawing object should be fully dimensioned on the same layer as the drawing. The completed drawing should be printed on 8 ½" x 11" paper and presented to another classroom student for review.

The student who reviews the drawing, someone other than the originator, will check the drawing for missing dimensions, correct views and compliance with the requirements. After checking the drawing the reviewing student will sign the drawing in the "approved by" area and hand in the drawing to the teacher for grading.

### **Assignment #4- 3D CAD Drawing or Solid Model (software dependent)**

Create a 3D model for a typical machine part with four or more separate features such as:

- Planar Extrusions
- Planar Cuts
- Revolved Extrusions
- Revolved Cuts
- Slots
- Round holes to a depth less than the feature being cut (Blind hole)
- A threaded form element (either cosmetic or fully modeled)
- Other generated features (e.g. fillets, chamfers, arrays or patterns, chamfered holes, etc)

Instructor may choose any part from any machine that can be available for students to hold, measure and use; it should include at least one extruded (beyond the base feature), one slotted cut, one threaded, and one generated feature. Templates or solid primitives included with software may be modified as required. The 3D features should be created using sketches that are extruded or cut to the correct thickness or depth. All sketch features should be appropriately dimensioned to simulate the size and shape of the real machine part.

Once modeled, a screen shot of the finished model should be printed on 8 ½" x 11" paper and turned in to the teacher for grading. No dimensions are required on the screen shot. If using a 2D drafting software with 3D capability, The instructor will ask that a multi-view drawing like the one from assignment #3 also be made showing major dimensions (Length, Width, Thickness and other features as specified by the instructor). Alternately, if using a native 3D solids

modeling software and Assignment #4 is placed ahead of Assignment #3, the completed model may be used as the starting point for the drawing of Assignment #3.

Student's Name \_\_\_\_\_  
Processes

MFG 115 Design

College Now/CTE

**Teacher's Final Grade Worksheet**

**Assignment #1- Technical Sketches**

**GRADING: (OK=5 pts.; minor corrections=4 pts.; major corrections=3 pts.)**

	First time O.K	Needed minor correction	Needed major correction
Student did not use any drawing aids	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Student correctly depicted the views of an object using a multi-view drawing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Student understands and has drawn hidden, centerline, and correctly weighted object lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Student has dimensioned parts correctly and sufficiently to manufacture the item	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1 <sup>st</sup> sketch is legible and complete	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 <sup>nd</sup> sketch is legible and complete	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3 <sup>rd</sup> sketch is legible and complete	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**#1- 3 sketch point score \_\_\_\_\_**  
**35 to 21 points possible**

**Assignment #2- 2D CAD Drawing or sketch (solids modeling)**

	Yes (5pts each)	Missed (0)
Student has demonstrated the use of Grid and Snap commands	<input type="checkbox"/>	<input type="checkbox"/>
Drawing / sketch required use of construction lines / features	<input type="checkbox"/>	<input type="checkbox"/>
Drawing / sketch required use of trim, extend or offset commands	<input type="checkbox"/>	<input type="checkbox"/>
Drawing / sketch required use of the Array command	<input type="checkbox"/>	<input type="checkbox"/>
Drawing / sketch entities were translated or copied	<input type="checkbox"/>	<input type="checkbox"/>
Drawing / screen shot was printed in appropriate scale for paper size	<input type="checkbox"/>	<input type="checkbox"/>
Drawing was appropriately complex to receive credit for assignment	<input type="checkbox"/>	<input type="checkbox"/>
Student demonstrated dimensioning on a separate layer in drawing or Used appropriate Solids Modeler software	<input type="checkbox"/>	<input type="checkbox"/>

**#2-2D CAD drawing point score \_\_\_\_\_**  
**40 to 0 points possible**

**Assignment #3 2D CAD Drawing**

	Yes (5pts each)	Missed (0)
Drawing was created with multiple views (top, front and side)	<input type="checkbox"/>	<input type="checkbox"/>
Drawing includes simplified or schematic threads	<input type="checkbox"/>	<input type="checkbox"/>
Drawing includes an angled line	<input type="checkbox"/>	<input type="checkbox"/>
Drawing included descriptive text	<input type="checkbox"/>	<input type="checkbox"/>
Drawing includes a cross hatched sectional view	<input type="checkbox"/>	<input type="checkbox"/>
Drawing includes at least 3 different size holes	<input type="checkbox"/>	<input type="checkbox"/>
Drawing includes an elongated slot depiction	<input type="checkbox"/>	<input type="checkbox"/>

All required dimensioning was present on print



**#3-2D CAD drawing point score \_\_\_\_\_**  
**40 to 0 points possible**

**Teacher's Final Grade Worksheet (Continued)**

**Assignment #4 3D CAD Drawing**

	<b>Yes (5pts each)</b>	<b>Missed (0)</b>
Object/model includes at least 4 different features	<input type="checkbox"/>	<input type="checkbox"/>
Object/model includes at least one extrusion (beyond the base feature)	<input type="checkbox"/>	<input type="checkbox"/>
Object/model includes at least one slotted cut element	<input type="checkbox"/>	<input type="checkbox"/>
Object/model includes at least one threaded element	<input type="checkbox"/>	<input type="checkbox"/>
Object/model includes at least one generated element (fillet, chamfer etc.)	<input type="checkbox"/>	<input type="checkbox"/>
Sketches used for each feature are appropriately dimensioned	<input type="checkbox"/>	<input type="checkbox"/>
Sketches used for each feature are appropriately sized	<input type="checkbox"/>	<input type="checkbox"/>
Screenshot of finished model was printed on 8 1/2" x 11" paper	<input type="checkbox"/>	<input type="checkbox"/>

**#4-3D CAD drawing point score \_\_\_\_\_**  
**40 to 0 points**

**Drawing Assignment #1- Technical Sketches-** Raw point score \_\_\_\_\_ ÷ 1.6 = \_\_\_\_\_  
(35-21)      (22-13.1)

**Drawing Assignment #2- 2D CAD Drawing-** Raw point score \_\_\_\_\_ ÷ 1.6 = \_\_\_\_\_  
(40-0)      (25-0)

**Drawing Assignment #3 2D CAD Drawing-** Raw point score \_\_\_\_\_ ÷ 1.6 = \_\_\_\_\_  
(40-0)      (25-0)

**Drawing Assignment #4 3D CAD Drawing-** Raw point score \_\_\_\_\_ ÷ 1.6 = \_\_\_\_\_  
(40-0)      (25-0)

**Alphabet of Lines Assignment-** Raw point score \_\_\_\_\_  
(1-0)

**Orthographic Projection Assignment-** Raw point score \_\_\_\_\_  
(1-0)

**Dimensioning Assignment-** Raw point score \_\_\_\_\_  
(1-0)

**Grand total raw point score \_\_\_\_\_**  
(110-10.5)

**MANUFACTURING APPLIED TECHNOLOGY CENTER  
COURSE SYLLABUS**

**COURSE TITLE:** DESIGN PROCESSES I

**COURSE NUMBER:** MFG 119

**COURSE DATE:** Fall, Winter, Spring and Summer Terms **CONTACT HOURS:** 60  
Self Paced Program, classroom and lab  
schedule per MATC open hours

**CREDIT HOURS:** 2

**COURSE LOCATION:** Building #3 Redmond Campus Rm 317

**INSTRUCTOR:** MATC INSTRUCTOR AS DESIGNATED

**COURSE DESCRIPTION:** Introduction to computer aided manufacturing. Includes interpretation and construction of technical drawings and technical sketching.

**PREREQUISITES:** MFG 100 MATC Orientation and Instructor's Approval

**REQUIRED TEXT:** MFG 115 Course Packet, Amatrol e-learning access (included in class fee)

**REQUIRED EQUIPMENT:** Calculator, Notebook

**OUTCOMES:** The student will demonstrate how to...

- Interpret technical drawings and extract needed dimensional information
- Interpret multi-view CAD drawings.
- Create 3D solids models and assemblies of mechanical objects
- Create CAD Design Drawings based on Solid Models

**INSTRUCTIONAL METHODS:** This course is taught using various methods including web presentations with computerized testing, textbook chapters with paper quizzes and open class discussion.

**MATC SUPPLIED TEXTBOOK AND MATERIALS:** Design Processes I digital drawings and models



## TOPICS:

- CAD 3D Modeling fundamentals
- Introduction to technical drawing
- Multiview CAD drawings

## ASSESSMENT GRADE:

See Department Grading Standards

**POLICIES:** The following course and college policies apply to each student enrolled in this course.

Student rights and responsibilities	Please read the Students Rights and Responsibilities handbook available at: <a href="http://cocc.edu/policies/general-procedures-manual/student/student-rights-and-responsibilities.aspx">cocc.edu/policies/general-procedures-manual/student/student-rights-and-responsibilities.aspx</a>
Americans with disabilities	Students with documented disabilities who may need accommodations, who have any emergency medical information the instructor should know of, or who need special arrangements in the event of evacuation, should make an appointment with the instructor as early as possible, no later than the first week of the term. Students may also wish to contact the COCC Disability Services Office in the Boyle Education Center at (541) 383-7583.
Non-discrimination policy	Central Oregon Community College is an affirmative action, equal opportunity institution. It is the policy of the Central Oregon Community College Board of Directors that there will be no discrimination or harassment on the basis of age, disability, gender, marital status, national origin, race, religion, sexual orientation, or veteran status in any educational programs, activities or employment. Persons having questions about equal opportunity and non-discrimination, please contact Human Resources for referral to the appropriate personnel, (541) 383-7236.
Student insurance	Students are not covered by medical insurance while on campus or involved in college classes and activities. Students are responsible for their own medical and dental insurance coverage.
Disruptive behavior	Students and faculty each have responsibility for maintaining an appropriate learning environment. Disruptive behaviors that interfere with the learning or teaching process will not be tolerated. Examples include, but are not limited to: talking in class, cell phone use or text messaging, sleeping, or in any other way not engaging in class activities, arriving late or leaving early without informing the instructor, or any other behavior that in any way negatively impacts the learning environment. Students exhibiting this behavior will be given a warning and then asked to leave the class if the behavior persists. All disruptive behavior will be reported to the Director of Student Life and could result in dismissal from the class.
Cheating and plagiarism	Students are expected to practice the highest standards of academic honesty. Acts of plagiarism or cheating are unacceptable and will result in a failing grade on the assignment and could end in dismissal from the course. Plagiarism is using, borrowing or stealing someone else's words or ideas without giving credit to the source. This includes copying definitions and sentences from textbooks, periodicals, and other student's papers, the Internet or any other resource. Cheating on any assignment or test in any form is also unacceptable. Students are expected to complete all assignments independently, unless it is designated as a group assignment. All acts of cheating or plagiarism will be reported to the Director of Student Life and disciplinary actions may result.

Final exam policy    The MATC is a self paced learning environment. The Final Exam for this course may be taken at any time once the student has completed all necessary assignments as required by the Skill Accomplishment Record and received written approval to take the exam from the Instructor of Record. Final Exams are closed book, closed note. Students must turn in their portfolio to the MATC Curriculum Room prior to taking the exam. Depending on the course, a student may be given their exam in electronic or paper form. In some courses, the Final Exam may consist of a hands-on project that will be completed in a lab. The last day to take the Final Exam for will be clearly posted on the white boards in the MATC classroom several weeks before finals week. Because of the flexible nature of the MATC program, there should be ample time to plan course completion and taking of the Final Exam. Makeup or special exams dates are not granted. However, if a student has been approved for a Final Exam and special circumstances prevent the taking of the exam by the end of the term, students should see their instructor of record in advance to arrange for an "I" grade so they can take the exam as soon as possible in the following term. If a student in this situation does not take the exam during the following term, COCC "I" grade policies will be applied and the course grade will become an "F".

#### **PHYSICAL CONTACT STATEMENT:**

Due to the nature of MATC courses, students are advised that physical contact between the instructor and student, or student to student may occur during some lab assignments. If you have concerns about these situations, you are encouraged to discuss these with the instructor prior to the next class session to determine if appropriate alternatives exist. If you do not think you will be able to participate to the extent required by the course, you are encouraged to drop the course within the appropriate deadlines in order to obtain a refund.