



MFG 115 Design Processes I
2 Credits
College Now/CTE
Student Outcomes Checklist
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 computer aided manufacturing. Includes interpretation and construction of technical drawings, and technical sketching. An optional extra credit assignment on CAD/CAM operations is provided.

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 mail or deliver the following documents to: College Now Office, Central Oregon Community College, 2600 NW College Way, Bend, OR 97703.

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

MATC Grading Standards

ASSESSMENT GRADE:

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

COURSE 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

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.

Computer Aided Manufacturing* performance requirements:

***Note use of Computer Aided Manufacturing is no longer a part of the MFG 115 curriculum at COCC. It is now covered exclusively in our MFG 234/236 courses. As such, Assignment #5 of the previous approved College Now curriculum has become an optional assignment that College Now instructors can choose to teach if they have class time and appropriate hardware/software .**

No specific CAM Software is required to satisfy this assignments. Substitution of different CAM software with similar menu items and drawing functions can be used where no direct software correlation exists to meet the following course requirements. For those schools that do not have a CNC machine use the built-in verification program to determine if the student program meets CNC operational requirements.

The CAM part should be self-designed and include drilled holes, student initials, and a milled shape or feature or as the teacher assigns. Check before starting.

Optional Extra Credit Assignment #5-CAM project

- 1) The student will use the configuration screen to select either inch or metric measuring systems as desired.
- 2) The student will create appropriate part geometry using the CAM system drawing tools to produce the self-designed part or teacher-assigned CAM project.
- 3) The student will correctly assign cutting tools for each operation required in the CAM program.
- 4) The student will show the teacher the back plot or other program proofing tool to verify that the programmed tool operations are complete.
- 5) When instructed to do so, the student will post-process the CAM program tailoring it as required for the classroom CNC machine operational parameters.

With teacher's assistance the student will download the student generated CNC program to a CNC machine controller and setup any necessary tools as directed by the teacher. The teacher or an assigned aide will help set any required tool length and part zeroing requirements for the CNC machine while providing the student with an explanation of the process as it is accomplished.

The student's CAM generated part should then be produced using the CNC machine.

The student will present the following corner stapled package of completed work to the teacher for grade:

Assignment #5- CAM documentation requirements:

1. Cover sheet with student name, date, school, course and part name.
2. A CAD/CAM drawing or hardcopy of the part.
3. An Operator Setup Sheet detailing the part in a vise or holding fixture.
4. A Setup Sheet providing an indication of part XY zero and the Z axis tool set point on the part.
5. A Tooling Page listing the cutting tools required to produce the part.
6. The machined* CNC generated part.

** Or appropriate CAM computer simulation for those school's without CNC capabilities.*

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 st sketch is legible and complete	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 nd sketch is legible and complete	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3 rd 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	<input type="checkbox"/>	<input type="checkbox"/>

#3-2D CAD drawing point score _____
40 to 0 points possible

Teacher's Final Grade Worksheet (Continued)

Assignment #4 3D CAD Drawing

	Yes (5pts each)	Missed (0)
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 possible	

Optional Extra Credit #5 CAM project (AT DISCRETION OF INSTRUCTOR)

	Yes (2pts each)	Missed (0)
Cover sheet with student name, date, school, course and part name.	Include but not graded.	
A drawing or hardcopy of the part	<input type="checkbox"/>	<input type="checkbox"/>
An operator setup sheet detailing the part in a vise or holding fixture	<input type="checkbox"/>	<input type="checkbox"/>
A setup sheet providing an indication of part XY zero and the Z axis tool set point	<input type="checkbox"/>	<input type="checkbox"/>
A tool page listing the cutting tools required to produce the part	<input type="checkbox"/>	<input type="checkbox"/>
Image of the machined or simulated CNC generated part	<input type="checkbox"/>	<input type="checkbox"/>
Optional Extra Credit #5- CAM project point score	_____	
	10 to 0 points possible	

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)
Optional Extra Credit #5 CAM project-	Raw point score _____ (10-0)
Grand total raw point score	_____ (110-10.5)

**MANUFACTURING APPLIED TECHNOLOGY CENTER
COURSE SYLLABUS**

COURSE TITLE: DESIGN PROCESSES I

COURSE NUMBER: MFG 115

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: cocc.edu/policies/general-procedures-manual/student/student-rights-and-responsibilities.aspx
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.