Technical Drawing - AutoCAD
MCC Dual Credit - MET 101
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COURSE OUTLINE

Course Description
This course is part of the area of Information/Communication Technology. It introduces the basic concepts of Technical Drawing using a Computer Assisted Drafting (CAD) program.

Text Book
Basic Technical Drawing
8th Edition
Authors
Henry Cecil Spencer
Jhon Thomas Dygdon
James E. Novak
Mc Graw Hill - Glencoe
ISBN 0-07-845748-3

Goals
The topics covered in this course are geared towards the application of CAD drafting skills to develop solutions to design problems. Student will produce 2D and 3D sketches while learning the 2D and 3D capabilities of the CAD software. The main goal of the course is to communicate the philosophical and engineering intent of an idea by means of a technical drawing.

Methodology
Students will participate in classroom presentations, demonstrations, and discussions with the direction of the classroom instructor. Students will maintain an electronic notebook, all drawings will be posted on the BHS website as .pdf’s. Finished drawing will be E-mailed to the instructor and will be maintained in your electronic notebook. Test and quizzes are based on the information presented during class discussions.

Units of Study

- Getting Started
  Starting a new drawing
  The screen layout
  Command Line & using the keyboard
  Opening an existing drawing
  Using your Pointing Device
  AutoCAD’s Cartesian Workspace

- Basic Drawing and Editing
  Drawing Lines, Rectangles & Circles
  Erasing Objects
  Using Direct Distance Entry & Polar Tracking
Drawing with Grid & Snap
Viewing your drawing
Using Undo
Saving your Work
Exiting AutoCAD

• Drawing Precision
  Using Object Snap & Object Snap
  Overrides
  Polar Tracking Summary
  Object Snap Tracking

•Changing Your Drawings
  Selecting Objects for Editing
  Moving & Copying Objects
  Rotating & Scaling Objects

• Setting Up a Layout
  Printing Concepts
  Working in Layouts
  Creating a New Layout
  Guidelines for Layouts

• Printing
  The PLOT Command
  Plot Settings
  Plot Preview

• Organizing Your Drawings
  Creating New Drawings with Templates
  What are Layers?
  Layer State
  Changing an Object’s Layer

• Drawing Information
  Measuring a Distance & Area
  Information about Objects

• More Object Types
Drawing Arcs & Polylines
Converting Polylines to Lines & Arcs
Converting Lines & Arcs to Polylines

• Advanced Editing Commands
  Using Trim, Extend, Fillet & Chamfer
  Offsetting & Mirroring Objects
  Creating Arrays of Objects

• Inserting Blocks
  What are Blocks?
  Inserting Blocks
  Using DesignCenter to Insert Blocks

• Annotation
  Adding, Formatting & Editing Multiline Text
  Other Text Tools
  Spell Checking Text
  Using & Editing Hatch Patterns
  Dimensioning Concepts
  Dimension Tools
  Adding & Editing Dimensions
  Basic Leaders
  Selecting a Dimension Style

• Advanced Editing
  Change an Object’s Length using Stretch, Lengthen & Break
  Productivity Tools (Object Selection, Quick Select & Editing with Grips)

• Efficient Construction Techniques
  Accurate Positioning
  Create & Manage Blocks

• Drawing Setup and Utilities
  Creating Templates
  Advanced Viewing Tools (Zoom Options, Drawing Views & Multiple Viewports)
Grading

- **Quarter 1 (First 10 weeks): 2/5 of your grade = 40%**
  - Drawings 70%
  - Tests, quizzes, special projects 20%
  - Electronic Notebook 10%

- **Quarter 2 (Second 10 weeks): 2/5 of your grade = 40%**
  - Drawings 70%
  - Special projects 20%
  - Electronic Notebook 10%

- **Final" 1/5 of your grade = 20%**
  - Final Project 20%

**Grade Scale**

A  90-100
B  80-89
C  70-79
D  65-69
E  50-64
F  0-49

All grades are letter grades and are based on the table in the Parent/Student handbook.

* Quizzes and Tests will check knowledge based on discussions, demonstrations, presentations, reading assignments and experiments.

**Please no eating or drinking in the computer lab.**

**General Information**

- be seated at the beginning of the period so attendance can be taken
- do not begin work until the instructor tells you to do so
- bring a pencil to class each day
- leave laboratory equipment alone until instructor gives you permission to use it
- ask questions when in doubt
• safety will be stressed

Safety Rules

• Behavior that involves horse-play and rough-housing will not be tolerated.
• Safety glasses must be worn at all times.
• Use equipment only when the instructor has indicated you may do so.
• Use equipment only if you have been instructed on how to use it during this semester.
• Do not work if you are tired or drowsy due to medications or lack of sleep.
• Be sure that safety guards and shields are in place when using equipment.
• If any situation arises that appears to be potentially dangerous, to you or anyone else, contact the instructor immediately.
• In the event of a fire in the laboratory, inform the instructor at once and follow his/her instructions.

Bibliography:
http://www.insighta.co.uk/courses/autocad/autocad_lvl2.htm
http://www.bcsd.org/webpages/mhuot/index.cfm?subpage=17712
# Technology Notebook

<table>
<thead>
<tr>
<th></th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Table of Contents</td>
<td>25 points</td>
<td>0 points</td>
</tr>
<tr>
<td>2. Pages Numbered</td>
<td>15 points</td>
<td>0 points</td>
</tr>
<tr>
<td>3. All work in folder</td>
<td>50 points</td>
<td>-5 points per missing item.</td>
</tr>
<tr>
<td>4. First and last name, grade, class and period on folder.</td>
<td>10 points</td>
<td>0 points</td>
</tr>
<tr>
<td></td>
<td>100 points</td>
<td></td>
</tr>
</tbody>
</table>

**Grading:** The number of points accumulated = the grade you will receive
Autobiography Project

Procedures:
1. Take a digital photo of the person next to you.
2. Switch the camera and have that person take a photo of you.
3. Open a Word document.
4. Insert the digital photo of yourself into your document.
5. Answer the following questions in complete sentences.
   a) What is your name and what do you like to be called?
   b) What is your parent or guardian’s name?
   c) What is your parent or guardian’s phone number?
   d) What grade are you in?
   e) What is your email address?
   f) What background do you have for this course?
   g) Why are you interested in this course?
   h) What are your expectations for this course?
   i) Are there any special projects you are interested in working on?
6. Format your document to look like the example given.
7. Save your document
8. Print your document to .pdf
9. Email it to me @ chris_french@bcasd.org
a) My name is Christopher M. French. I like to be called Mr. French.
b) My mom’s name is Bea French and my dad’s name is Fred French.
c) My parent’s phone number is (585) XXX-XXXX.
d) I am in grade ____.
e) My email address is: chris_french@bcasd.org
f) The background that I have for this course is that I have been teaching a variety of technology courses for 10 years. I took technology education courses in high school and college. I have earned a Master’s Degree.
g) I am interested in this course because I enjoy hands-on projects and problem solving.
h) I hope to see students develop strong problem-solving skills and the ability to be creative in a safe environment.
i) I am interested in working on Sumo cars and exploring alternative energy sources.
Coordinate System

- X
  - @3<270
    - (1,1)
    - (@3<270)
  - (0,0)
  - @5<180
    - (1,4)
  - @3<90
    - (6,4)

+ Y
  - @5<180
    - (@-5,0)
    - (@0,3)
  - @0<90
    - (@0,-3)
    - (@5,0)
  - +X

- Y
  - (@x,y) = Relative
  - X,Y = Absolute
  - @Distance < Angle = Polar
GASKET

The following drawing exercise is for practice. You should construct the drawing then (before creating polylines) practice finding the perimeter and area of the gasket (with and without the holes). You may also wish to draw lines from, for example, the centers of the two small, right holes then measure the length of that line and its angle relative to the XY plane. When finished with the above, convert the circles and outline into polylines (use BPOLY) and give them a thickness of 0.01. Proceed to dimension the drawing as indicated in the attached drawing.

Construct the attached drawing using the following settings:

1. Drawing size: Acad prototype (8.5 x 11)
2. Set UNITS to Decimal, precision to 0.00.
3. Set POINT STYLE to +, size to 0.05.
4. Type DIMCEN and set center mark to -0.09.
5. Set Text Style to: ROMANS, Height = 0.12.
6. Set Dimension Features to the following:
   • Extension above line: 0.12.
   • Arrow Height: 0.12.
   • Horizontal: Default.
   • Vertical: Centered.
   • Alignment: Orient Text Horizontally
7. Begin the drawing with the large center circle at X = 5.50, Y = 4.25.
8. You may need to change Horizontal and Vertical text settings to place Radius and or Diameter dimensions. Accept all other settings as defaults after setting the above.
9. Set POLYLINE width to 0.01 after converting entities to polylines.
OFFSET Command in AutoCAD

The OFFSET command can be used to start an entity a fixed distance from another point or location as well as create boundaries (if polylines are used) a fixed distance from an existing boundary. In the exercise below, you will first construct an object, use CHAMFER and FILLET to modify the corners of the object, then use OFFSET to create entities a specific distance from the object. You will also use the PEDIT (Polyline edit) command to change entities (lines) into polylines so that the offset command will apply to multi-line objects.

1. Start AutoCAD and use the normal acad prototype. This produces an 8-1/2” x 11” drawing field on which you will draw. If you are to save this drawing, immediately use the SAVEAS command to give it a name and place it on your disk. Once the drawing is saved using the SAVEAS command, you need only use the SAVE command or icon to save it periodically thereafter.

2. Select the LINE tool and begin a line at 3.5,2 <ENTER>.

3. Place points of the line at the following: @4,0 <ENTER>: @2,4<ENTER>: @-1.5,-.5<ENTER>: @-.5,2<ENTER>: C<ENTER>.

4. Select the FILLET tool. Type R <ENTER> to set the radius to .65 <ENTER>

5. Select the FILLET tool again and fillet the bottom left and bottom right corners of the drawn object.

6. Select the CHAMFER tool, type D <ENTER> and set both directions to .25.

7. Select the CHAMFER tool again and chamfer the upper left corner of the object.

8. Select OFFSET then type D <ENTER> and set distance to .3 <ENTER>. When asked to select object to offset, pick the vertical line at the right side of the object. When asked Side to Offset?, click to place new line offset to the right of the object. Press <ENTER> to exit command.

9. To offset an entire object, the object must be a single entity such as a polyline. To make the drawn object a polyline, select the PEDIT command. When asked to select the polyline, select the line at the bottom of the object. When asked if you wish to make it a polyline (Y), press <ENTER>. Notice that the polyline editing commands are now listed in the command line.

10. Type J (to join lines into one polyline), then select each line segment (clockwise or counter clockwise) until you have selected all other lines in the object then press <ENTER>. Now type W (to set width of polyline) and type .02 <ENTER>. The object lines will become thicker. Now type X <ENTER> to exit to the command line.

11. Select OFFSET and set the distance to .4. When asked to select object, select the polyline object just constructed in step 10. When asked side to offset? pick a point toward the inside of the object. The offset will create a second object (a polyline) on the inside of the object.
ARRAY Command in AutoCAD

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The ARRAY command can be used to create either a Rectangular ARRAY (column and row) or a Polar ARRAY (items spaced around a circle or arc). In this exercise, you will construct a bolt circle with a number of holes evenly spaced around a flange. You will use the POLAR ARRAY function. Follow the directions below.

1. Start AutoCAD and use the normal acad prototype. This produces an 8-1/2" x 11" drawing field on which you will draw. Use LINETYPE to LOAD the CENTER line and set text style to ROMANC. If you are to save this drawing, immediately use the SAVEAS command to give it a name and place it on your disk. Once the drawing is saved using the SAVEAS command, you need only use the SAVE command or icon to save it periodically thereafter.

2. Draw a circle at location 7.5 (center) with a radius of 2.

3. Draw another circle from the same center (7.5) with a radius of 3.5.

4. Change the linetype to CENTER and draw another circle at center 7.5 with a radius of 3. (Note: you may need to load the center line if it is not already loaded in AutoCAD)

5. Type DIMCEN (to set the center mark so that it will overhang the circle) and type -0.03 (minus decimal zero three) then press <ENTER>

6. Under DRAW, DIMENSIONS, RADIAL, pick CENTER MARK then pick the outer circle to place the center mark. This will give you an intersection to place the first bolt hole.

7. Change linetype back to CONTINUOUS.

8. Draw a circle at the top intersection between the bolt circle (center line) and the vertical center mark. Make this circle a radius of .25. After this circle is drawn, erase the center marks of the large circle and put a center mark in the .25 circle.

9. Under CONSTRUCT select ARRAY. When prompted to select objects, select the bolt hole just drawn and its center mark and press <ENTER> to confirm. When prompted for R or P, type P (for polar) and press <ENTER>.

10. When prompted for center of array, use CIRCLE CENTER snap to pick one of the large circles in the drawing (they all have the same center so it does not matter which one you pick).

11. When prompted for the number of items, type 9 and <ENTER>. When prompted for the degrees through which the array will span, type <ENTER> to select the default of 360. Also type <ENTER> as a response of Y (yes) to have the object rotated as it is placed around the bolt circle. This will rotate the center marks of the holes so that they radiate from the center of the bolt circle origin. You may enter dimensions if you wish.
1. "U" - BREAK LINES
2. Select Poly Line Edit.
3. W -
4. Close