A
Software Training Report
ON

AUTOCAD

Submitted a report on the completion of

Summer internship program 2nd year for Bachelor of Engineering

In Mechanical Engineering Department

Department of Mechanical engineering

MBM Engineering College, Jodhpur

Submitted to -

Mr. RAVIKANT MORDIA

Assistant professor

Submitted by -

ANKIT NAGAR

BE 2nd Year(A-1)

Acknowledgement

"An engineer with only theoretical knowledge is not a complete engineer. Practical knowledge is very important to develop and apply engineering skills".

I would like to express my special thanks of gratitude to my professor " Mr. Ravikant Mordiya" for their able guidance and support in completing my 6-week internship program.

I would also like to extend my gratitude to the Head of department of Mechanical engineering "Dr. Dinesh Shringi" for providing me the opportunity for doing this internship.

THANK YOU

Contents

History

The company behind AutoCAD, Autodesk was founded in 1982 by John Walker. He and the other 15 co-founders intended to develop five different desktop automation applications, hoping that one of the applications would take off. Their flagship product turned out to be AutoCAD. They launched AutoCAD at the COMDEX trade show in Las Vegas as the first CAD program in the world to run on a PC. By March 1986, only four years after it was introduced, AutoCAD had become the most widely used design application worldwide, a position it still holds today.

In its 35 years, AutoCAD has grown substantially. In fact, there has been 31 versions since the first release in December 1982! Over the years, Autodesk added new features and programs to appeal to different professions. The software supports APIs for customization and automation, which enabled the creation of vertical products such as AutoCAD Architecture, AutoCAD Electrical and AutoCAD Civil 3D. In the last five years, Autodesk has also created mobile and cloud-based apps, including AutoCAD 360, Fusion 360, and A360 Viewer. These programs couple design and documentation tools together with the ability to share and collaborate via the Internet.

Introduction

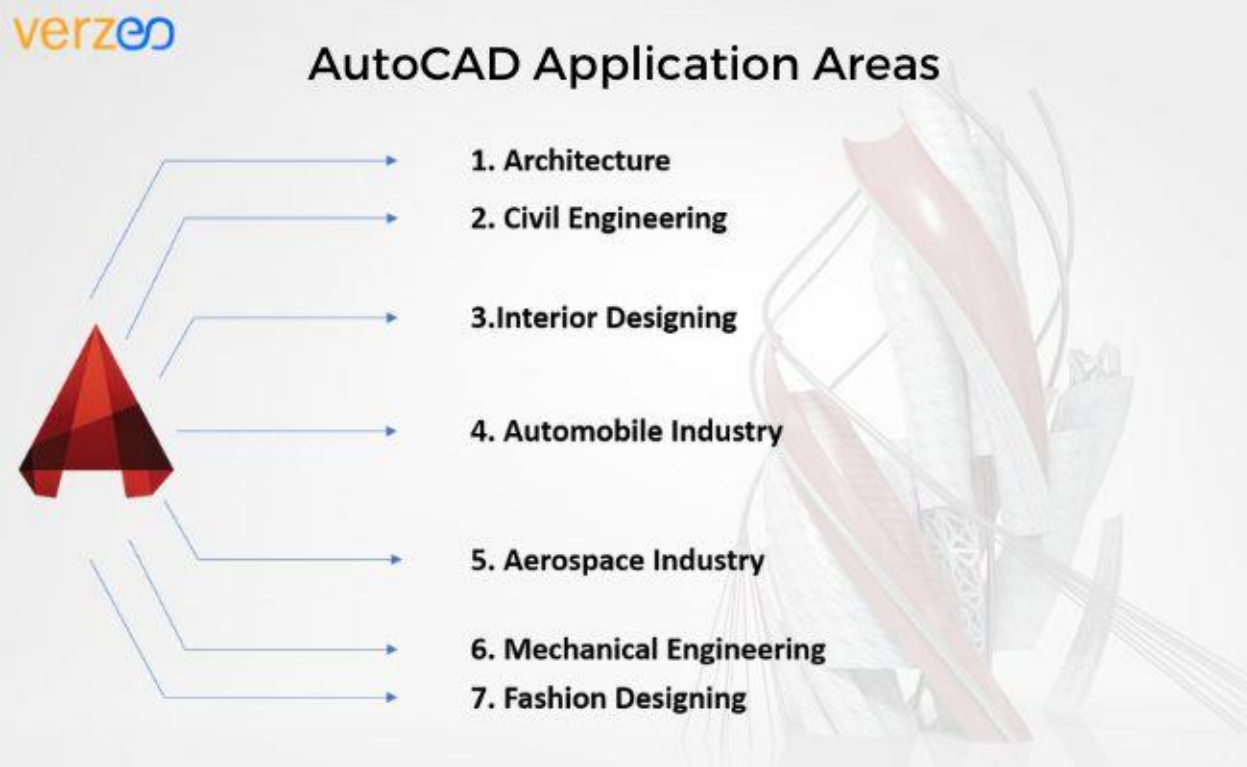
AutoCAD is a commercial software application for 2D and 3D computer-aided design (CAD) and drafting — available since 1982 as a desktop application and since 2010 as a mobile web- and cloud-based app marketed as AutoCAD 360.

Developed and marketed by Autodesk, Inc., AutoCAD was first released in December 1982, running on microcomputers with internal graphics controllers. Prior to the introduction of AutoCAD, most commercial CAD programs ran on mainframe computers or minicomputers, with each CAD operator (user) working at a separate graphics terminal. AutoCAD is used across a wide range of industries, by architects, project managers, engineers, graphic designers, and other professionals. It is supported by 750 training centers worldwide as of 1994.

As Autodesk's flagship product, by March 1986 AutoCAD had become the most ubiquitous CAD program worldwide. As of 2014, AutoCAD is in its twenty-ninth generation, and collectively with all its variants, continues to be the most widely used CAD program throughout most of the world.

Application

A lot of industries use AutoCAD for various purposes. Some of the main industries where AutoCAD finds its applications are as follows: -



1. AutoCAD in Architecture

AutoCAD is used to design Residential and Commercial building projects. The designs can be made in 2D or 3D to get an actual feel for how the building and its surroundings will look like once it is fully built. There is a specific version of AutoCAD for the architectural design called Autodesk Revit. Buildings and models can be digitally constructed using this software. It can also help in figuring out the elevation and plans.

2. AutoCAD's application in Civil engineering

There are a lot of applications of AutoCAD in Civil Engineering. They undertake large scale projects like building of Roads, Bridges, industrial complexes and other infrastructural projects. Using AutoCAD civil engineers can better design land development and water projects as they will understand how the project will perform, maintain data on it, and respond to change better.

3. Interior design & AutoCAD

AutoCAD doesn't just help in designing projects in interior design. As we can make accurate designs of the project digitally it can be used to demonstrate the project to your customers making it an important tool of marketing as well. 2D and 3D drawings of the plan give it a hyper-realistic feel. Some of the software used during pre-prep of a drawing sketch up, sketch up pro, and 3D max. Autodesk Homestyler is used to make realistic floor plans with additions such as doors, windows, and other elements.

4. Use of AutoCAD in Automobile Industry

AutoCAD can be applied in automobile engineering to design upholstery, engine, and wheels of an automobile. CAD is used to designing and developing automobiles including bikes and scooters. It can help in creating high precision designs that are very realistic and can be done in 2-D and then synced to bring about better innovative designs.

5. Aerospace Industry & AutoCAD

Planes, spaceships, missiles, etc are made on AutoCAD. Since this is an industry that requires high precision as building these machines cost a lot of money. The details are finalized on AutoCAD before beginning work on the final product.

6. Mechanical engineering

Mechanical engineers plan and design a lot of things on AutoCAD. It is applied in mechanical engineering to prepare designs that help in spotting issues before production begins. This saves time and money as the designs themselves can be analyzed and problems can be detected at an early stage and trouble shooted accordingly. AutoCAD also comes with a simulation function that can help us in seeing how a machine will function.

7. Fashion designing

It lets you select fabrics and patterns. Simulation function can be used to see how the design fits and looks so changes can be made before making the actual dress.

There are a lot of other places where AutoCAD is used. It is used by landscapers for marking the boundaries of a plot, placing pools, adding details to the fencing of an area, marking where lawns and other landscape-related things. It is also used in any industry that requires designing something like photography, jewellery, theatre, electronics to name a few. The life-like designs are what gives

anyone an edge which is why a lot of industries have adopted it. Something else that AutoCAD is popular for is for aiding 3D printing.

Advantages of using Autocad :

There are a lot of general advantages to using AutoCAD to design your products. Some of them are as follows:-

- Accurate and precise
- Time-saving
- Cost-effective
- Realistic representation
- Ability to make quick changes or modifications
- A platform where creativity and innovation can run free

Works Space of AutoCAD

Workspaces are sets of menus, toolbars, palettes, and ribbon control panels that are grouped and organized so that you can work in a custom, task-oriented drawing environment.

When you use a workspace, only the menus, toolbars, and palettes that are relevant to a task are displayed. In addition, a workspace may automatically display the ribbon, a special palette with task-specific control panels.

Firstly We Discuss About Workspaces of AutoCAD**:-**

1. Drafting & Annotation

2. 3D Modeling

Let‘s See Screen Of Different Work Spaces Of AutoCAD

1. Drafting & Annotation

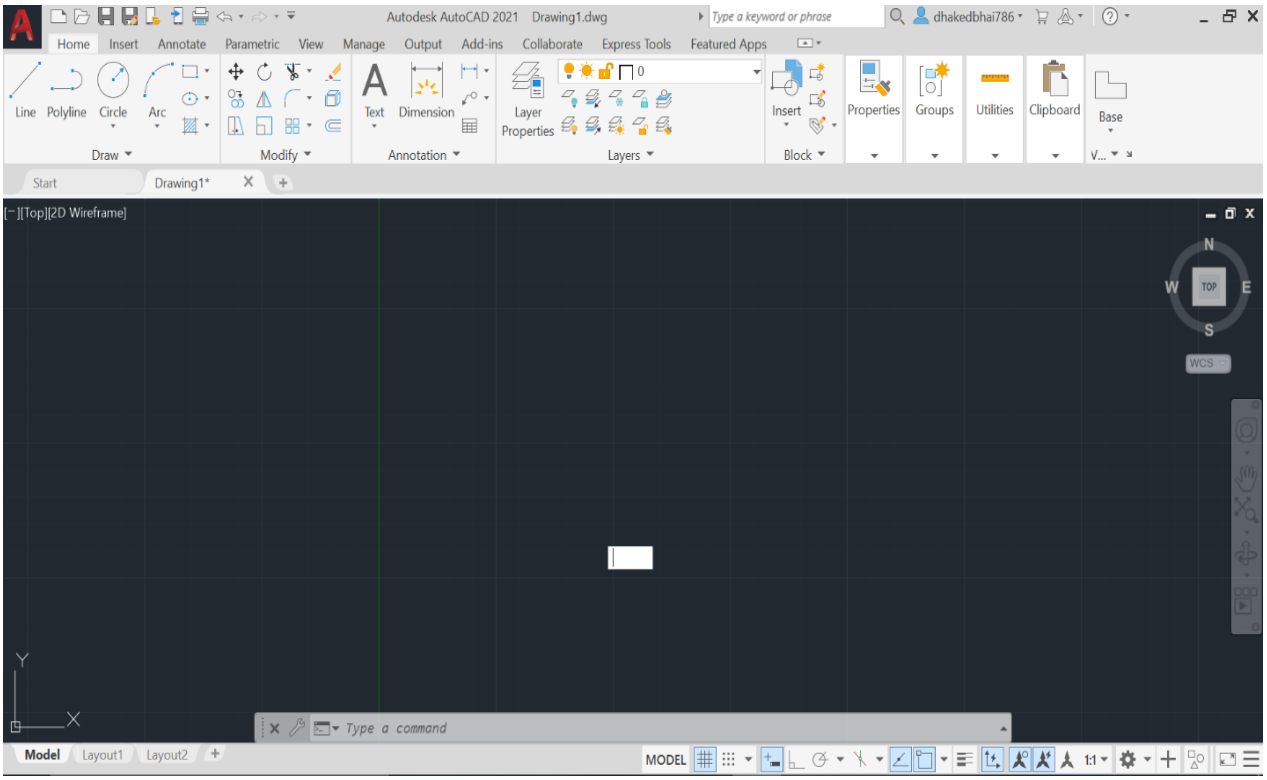


Figure 1: The AutoCAD in Drafting & Annotation

2. 3D Modeling

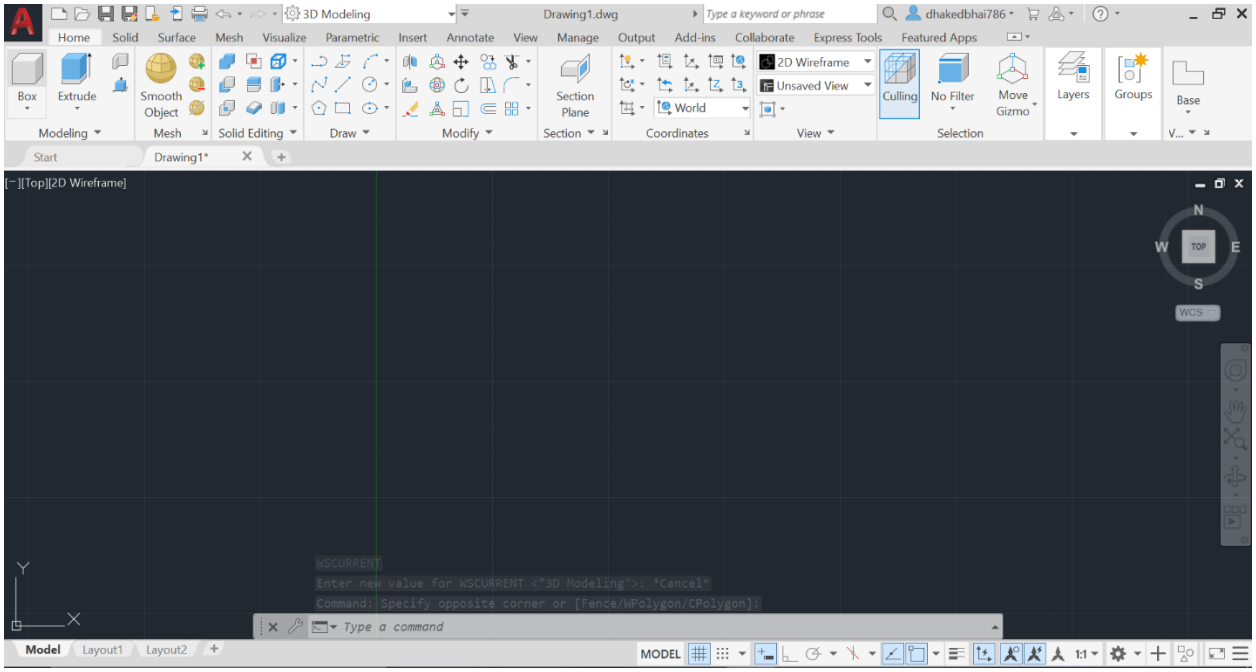


Figure 2: The AutoCAD in 3D Modeling

➢ AutoCAD Interface Overview

1. The Ribbon - Maximize the area available for work using a compact interface that contains many of the same tools and controls available in toolbars and dialog boxes. The ribbon can be displayed horizontally across the top of the drawing window, vertically to the left or right of the drawing window, or as a floating palette.

2. The menu Browser - Browse all of the classic drop-down menus available in AutoCAD, or perform a real-time search of the menus, menu actions, tooltips, command prompt text strings, and tags. Use the menu browser to browse for recent documents, currently open documents, and commands recently executed from the menu browser.

3. SteeringWheels - Access 2D and 3D navigation tools such as pan, zoom, orbit, rewind, and walk from a single interface. Start the navigation tools by clicking a wedge or by clicking and dragging the cursor over a wedge. You can access SteeringWheels from the drawing status bar.

4. InfoCenter - Search for information through keywords or phrases, display the Communication Center panel for product updates and announcements, or display the

Favorites panel to access saved topics. You can also receive information from RSS feeds to which you subscribe, or feeds published by your CAD manager.

5. Tool Pelettes - Organize, share, and place tools that are dragged from your drawing onto a tool palette or are provided from third-party developers. Change the properties of any tool on a tool palette and organize tool palettes into groups.

6. The Command Prompt - Execute a command by entering the full command name or command alias at the command prompt and pressing ENTER or SPACEBAR. When Dynamic Input is on and is set to display dynamic prompts, you can enter many commands in tooltips that are displayed near the cursor.

7. ViewPorts - Display multiple views of the same drawing, each with different visual styles. Add or remove viewports using the VPORTS command, or from the ribbon on the View tab in the Viewports panel.

8. Status Bar - View the coordinate values of your cursor, and access several buttons for turning drawing tools on and off, as well as many display tools used to scale annotations.

9. Show Motion - Access named views that are organized into categories of animated sequences within the current drawing. You can access ShowMotion from the drawing status bar.

10. ViewCube - Display visual feedback of the current orientation of a model, or adjust a model's viewpoint. Restore the previous view, or click and drag over the Rewind wedge to scroll through the navigation history to restore a previous view. You can access the ViewCube from the drawing status bar.

11. Quick Access Toolbar - Store commands that you frequently access in AutoCAD. By default, you can access New, Open, Save, Plot, Undo, and Redo from the Quick Access toolbar. Add commands to the Quick Access toolbar using the shortcut menus of all commands on the ribbon, menu browser, and toolbars.

12. Action Recorder - Automate repetitive drafting and editing tasks by recording action macros. Use most of the commands and user interface elements that are available in AutoCAD to create your action macro and then save it. You can find the Action Recorder on the ribbon's Tools tab.

AutoCAD Shortcut Keys Reference

Shortcut Key	Description
ALT+F4	Closes the application window
ALT+F8	Displays the Macros dialog box (AutoCAD only)
ALT +F11	Displays the Visual Basic Editor (AutoCAD only)
CTRL+F2	Displays the Text window
CTRL+F4	Closes the current drawing
CTRL+F6	Moves to the next file tab
CTRL+0	Toggles Clean Screen
CTRL+1	Toggles Properties palette
CTRL+2	Toggles DesignCenter
CTRL+3	Toggles the Tool Palettes window
CTRL+4	Toggles Sheet Set Manager
CTRL+6	Toggles dbConnect Manager (AutoCAD only)
CTRL+7	Toggles Markup Set Manager
CTRL+8	Toggles the QuickCalc palette
CTRL+8	Toggles the Command Line window
CTRL+A	Selects all the objects in drawing that are not locked or frozen
CTRL+SHIFT+A	Toggles Groups
CTRL+C	Copies objects to the Windows Clipboard
CTRL+SHIFT+C	Copies objects to the Windows Clipboard with Base Point

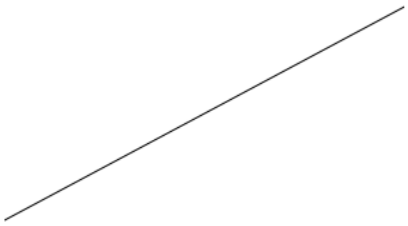
Ctrl +B	Toggles Snap
CTRL+C	Copies objects to the Windows Clipboard
CTRL+SHIFT+C	Copies objects to the Windows Clipboard with Base Point
CTRL+D	1. Toggles Dynamic UCS (AutoCAD only)
CTRL+E	Cycles through isometric planes
CTRL+SHIFT+E	Enables the use of implied faces and allow for the extrusion of a selected face
CTRL+F	Toggles running object snaps
CTRL+G	Toggles grid display mode
CTRL+H	Toggles PICKSTYLE
CTRL+I	Toggles the Coordinates display (AutoCAD only)
CTRL+SHIFT+I	Toggles Infer Constraints (AutoCAD only)
CTRL+J	Repeats last command
CTRL+K	Inserts a hyperlink
CTRL+L	Toggles Ortho mode
CTRL+SHIFT+L	Selects the previously selected objects
CTRL+M	Repeats last command
CTRL+N	Creates a new drawing
CTRL+O	Opens an existing drawing
CTRL+P	Plots the current drawing
CTRL+TAB	Moves the next file tab
F1	Display help
F2	Expands the command line

F3	Toggles OSNAP
F4	Toggles 3DOSNAP
F5	Togles ISOPLANE
F6	Toggles UCSDETECT
F7	Toggles GRIDMODE
F8	Toggles ORTHOMODE
F9	Toggles SANPMODE
F10	Toggles Polar Tracking
F11	Toggles Object Snap Tracking
F12	Toggles Dynamic Input

AutoCAD Basic Commands

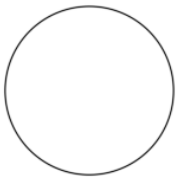
1. 2D Commands :

- Line – The line command is used to create a simple line of desired length.
  Shortcut Key - L



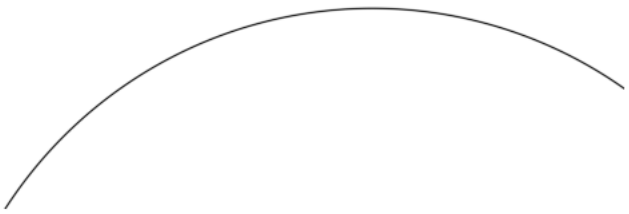
- Rectangle – This command is used to create a rectangle.
  Shortcut Key - REC

- Circle – This command is used to create a circle.
  Shortcut Key – C

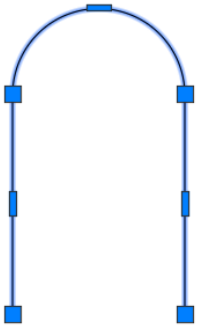


- Arc - The ARC command will allow you to create an arc by selecting a start point, second point , and endpoint.

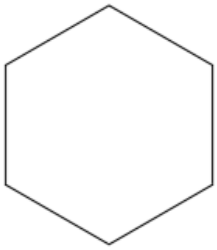
  Shortcut Key - A



- PolyLine – Polylines , can be lines or curves. And when the command has been completed all segments are joined together.
  Shortcut Key – PL

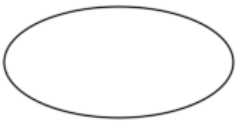


- Polygon – Creates an equilateral closed polyline.
  Shortcut Key -POL



- Ellipse – Creates an ellipse using a specified center point .

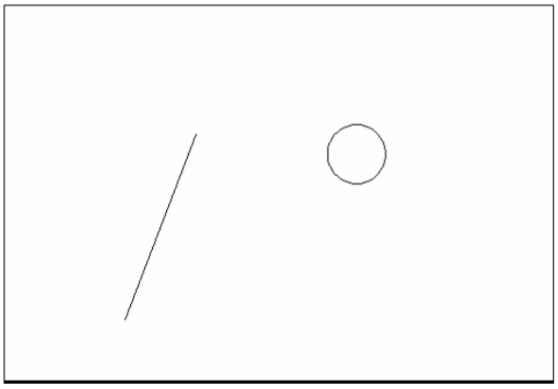
  Shortcut Key – EL



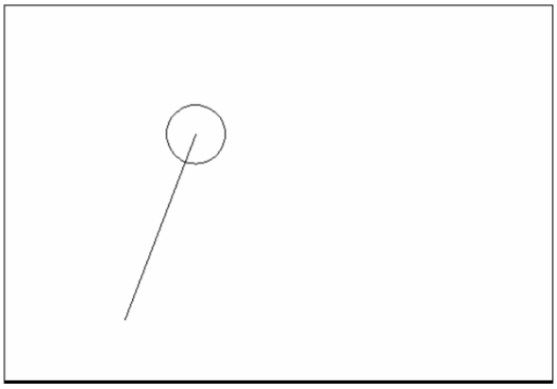
➢ Modify Commands :

❖ Move – Moves object a specified distance in a specified direction.
  Shortcut Key – M

Circle before move

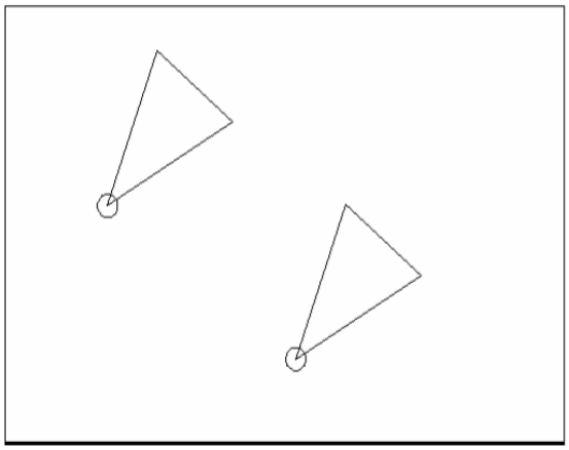


Circle after move

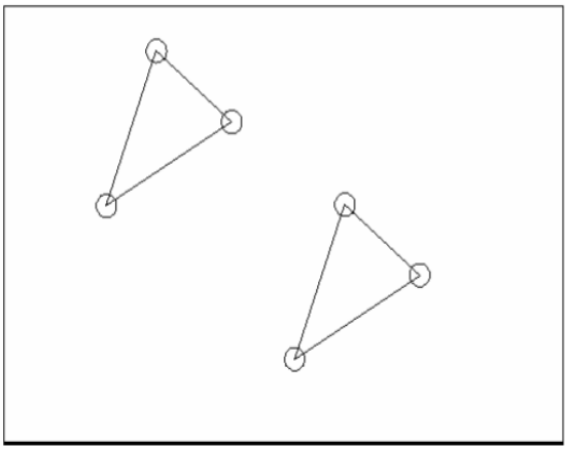


- Copy – Copies objects a specified distance in a specified direction.
  Shortcut Key – CO

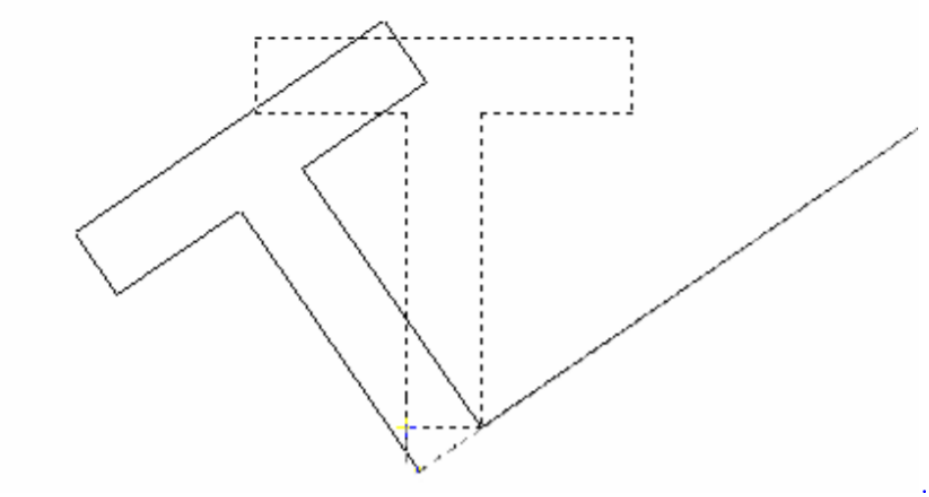
Duplicate objects copied



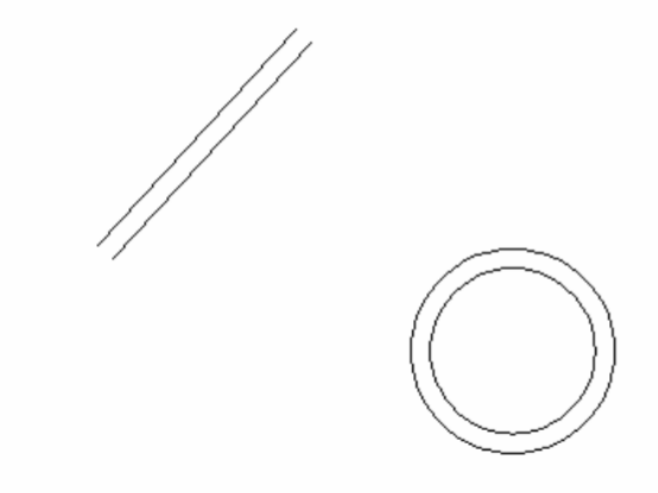
Multiple objects copied



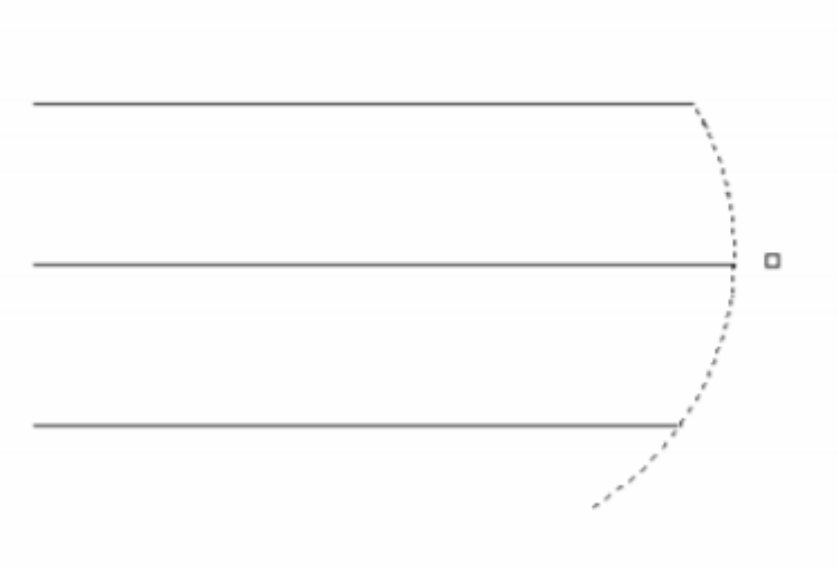
❖ Rotate – Rotates objects around a basepoint.
Shortcut Key – RO



❖ Offset – Creates concentric circles, parallel lines and parallel curves.
Shortcut Key – O



- Trim – Trim objects to meet edges of other objects.
  Shortcut Key – TR



Line trimmed to an arc

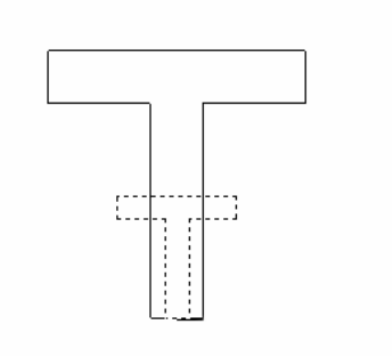
- Extend – Extend objects to meet edges of other objects.
  Shortcut Key – EX

Line extended to an arc

- Erase – Remove objects from drawing.
  Shortcut Key – ERA

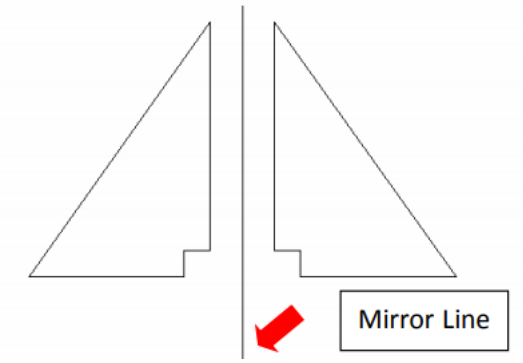
❖ Scale – Enlarges or reduces the selected objects keeping the proportions of the object same after scaling.

Shortcut Key – SC



❖ Mirror – Creates a mirrored copy of selected objects.

Shortcut Key – MI



➢ Display Commands :

▪ Zoom – Zooms to increase or decrease the apparent size of objects to current viewport.

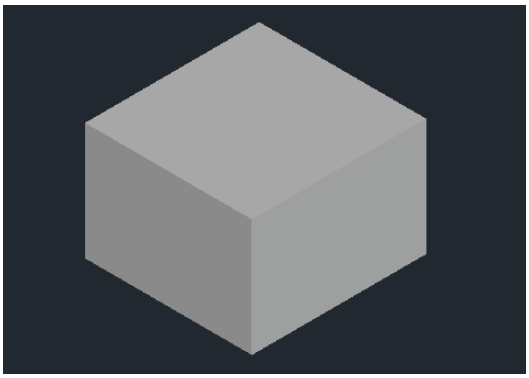
Shortcut Key – Z

▪ Pan – Moves the views in the current viewport.

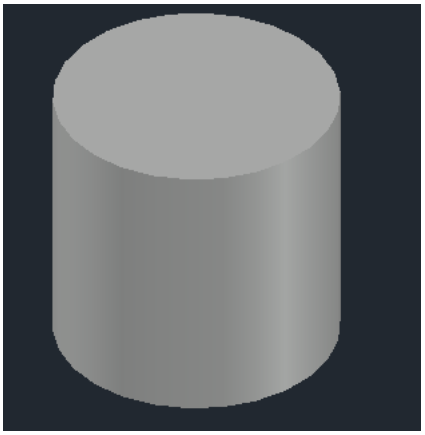
Shortcut Key – p

2. **3D Modeling Commands** –

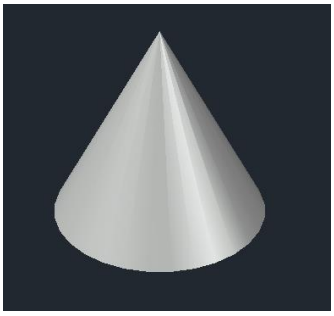
- Box – Creates a 3d solid box.
  Shortcut Key – BOX



- Cylinder – Creates a 3d solid cylinder.
  Shortcut Key – CYL

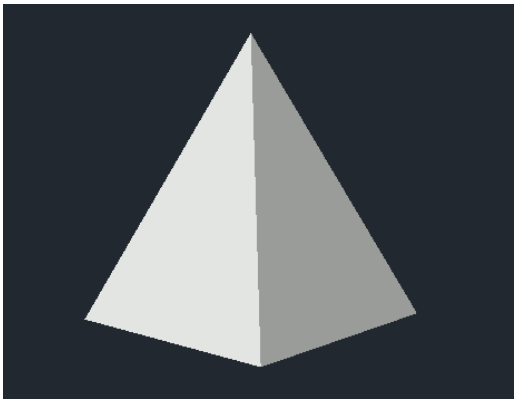


- Cone – Creates a cone.
  Shortcut Key – CONE



- Sphere - Creates a 3d solid sphere.
  Shortcut Key – SPHERE

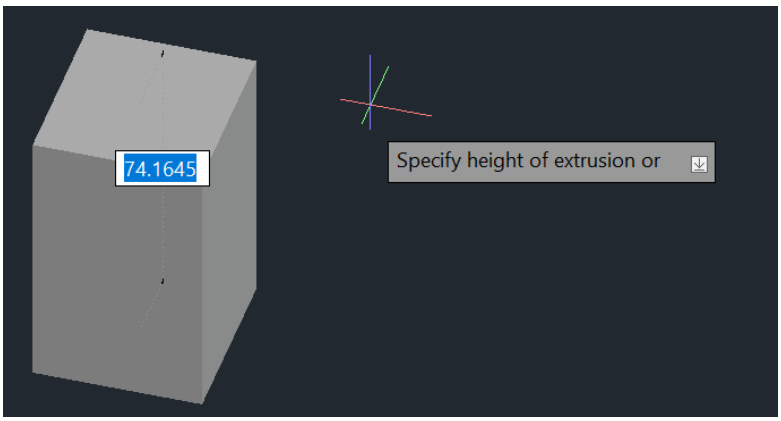
- Pyramid – Creates a pyramid.
  Shortcut Key – PYR



- Wedge – Creates a 3d solid wedge .
  Shortcut Key – WE

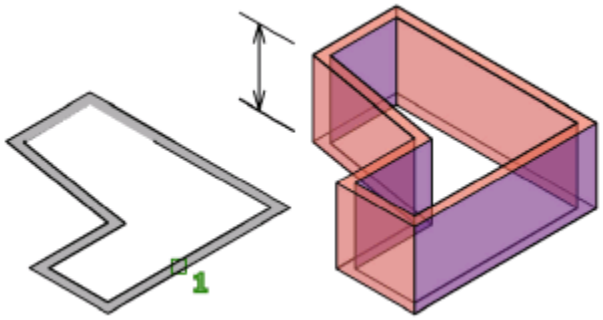
- Torus – Creates a donut-shaped 3d solid.
  Shortcut Key -TOR

- Extrude – Creates a 3d solid or surface by extruding a 2d 3d curve.
  Shortcut Key – EXT



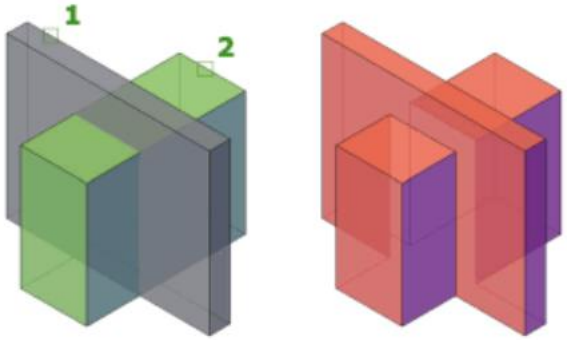
- Presspul – Presses or pulls bounded areas.

  Shortcut Key – PRESSPUL



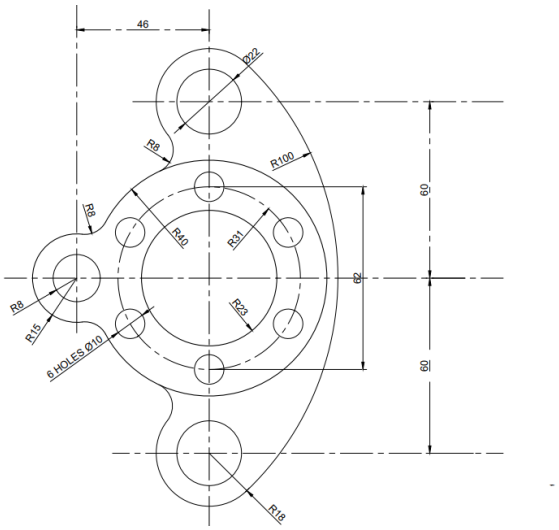
- Union – Combines 3D solid and 2D regions by addition.

  Shortcut key – UNI



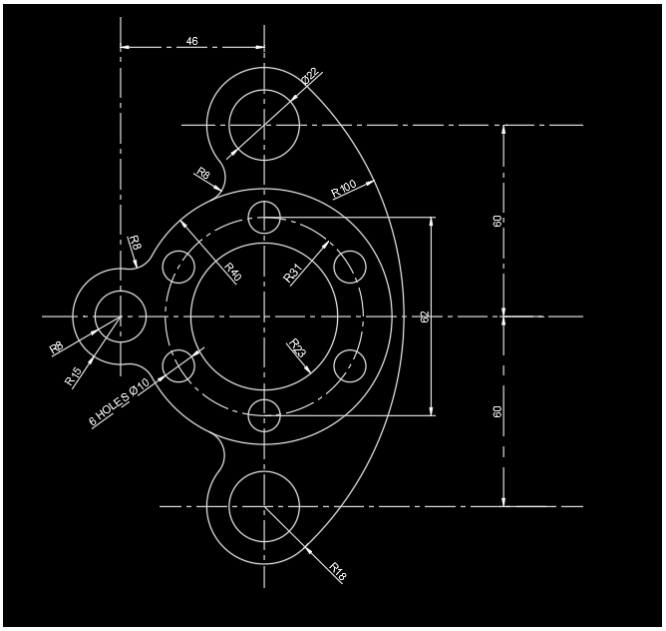
Assignment-1

Objective : Create a 2D drawing as given below using AutoCad.



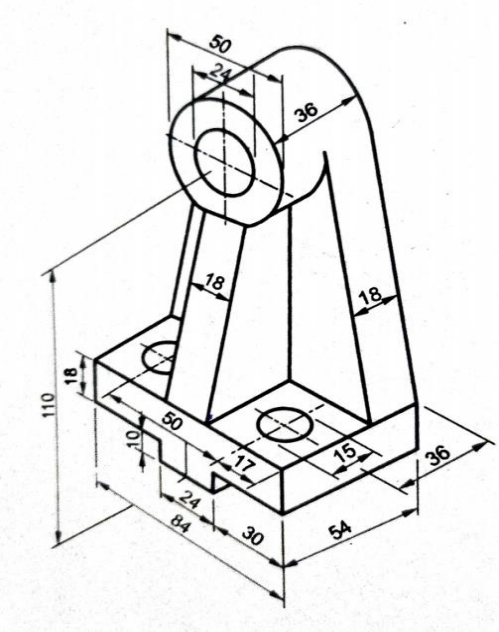
Commands used : Center – radius circle , center – diameter circle , polar array , fillet , trim , erase , copy , mirror .

Final Drawing :



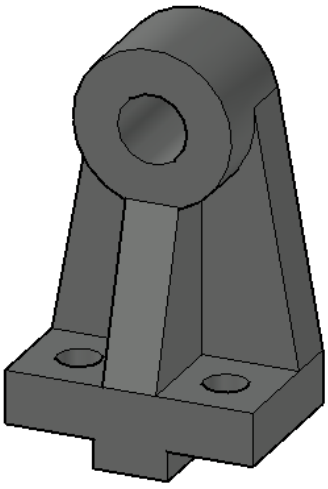
Assignment-2

Objective : Create a 3D model and orthographic projection of the given image.

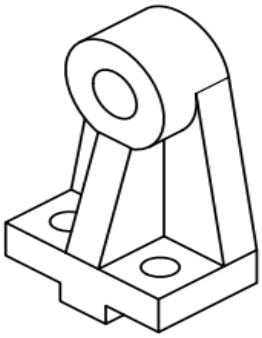


Commands used : rectangle , center – diameter circle , tangent line , extrude , presspull , Wedge .

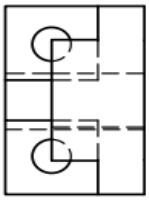
Final 3D Model :



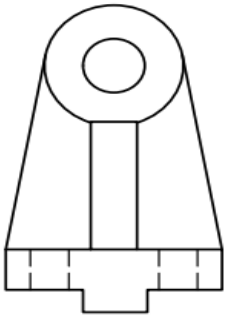
Orthographic Projection :



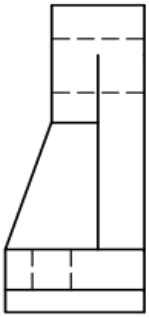
Isomatric view



Top view



Right view



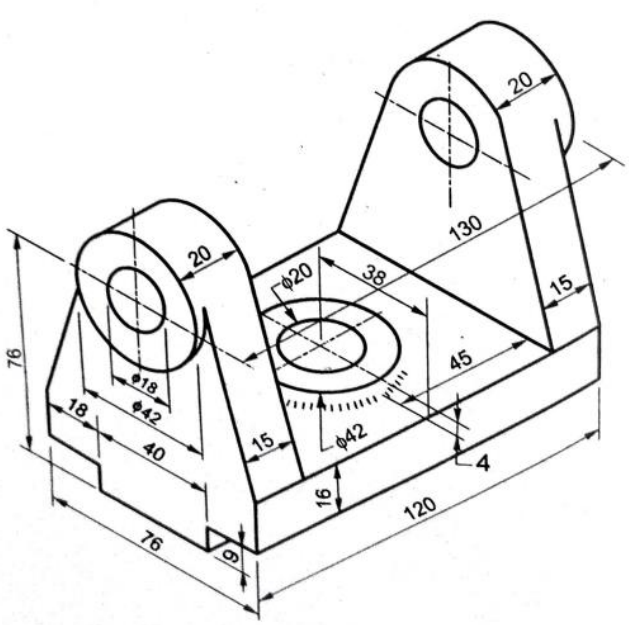
Front view

Procedure :

First of all we make it's 2D drawing from front view . Then we use presspull command according to given dimensions. Then we use wedge command and create a wedge as given in the drawing.

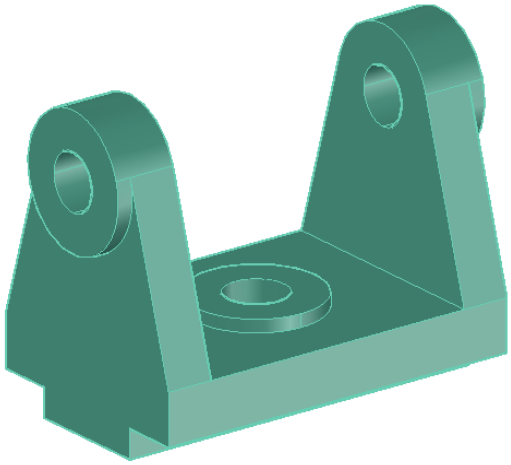
Assignment – 3

Objective : Create a 3D model and orthographic projection of the given image

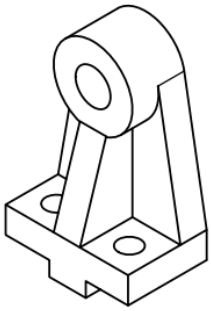


Commands used : rectangle , center – diameter circle , line , tangent line , extrude , presspull , UCS , mirror .

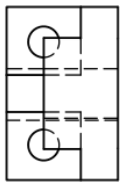
Final 3D Model :



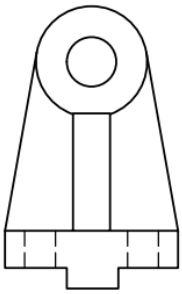
Orthographic projection :



Isomatric view



Top view



Right view

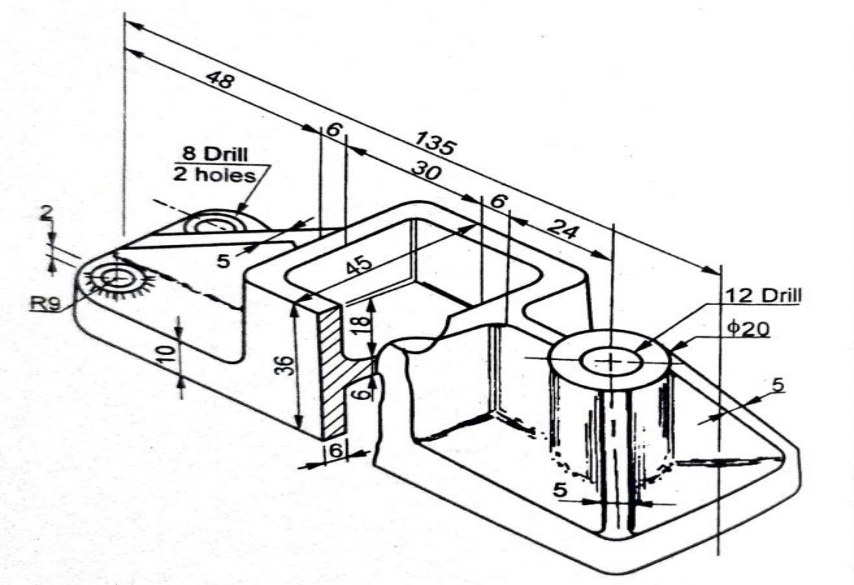
Front view

Procedure :

We start to create this drawing from front view. We draw it's front view in 2D then using presspull command we convert it in a 3D body . Using mirror command we mirror it's upper part to other side of the body .

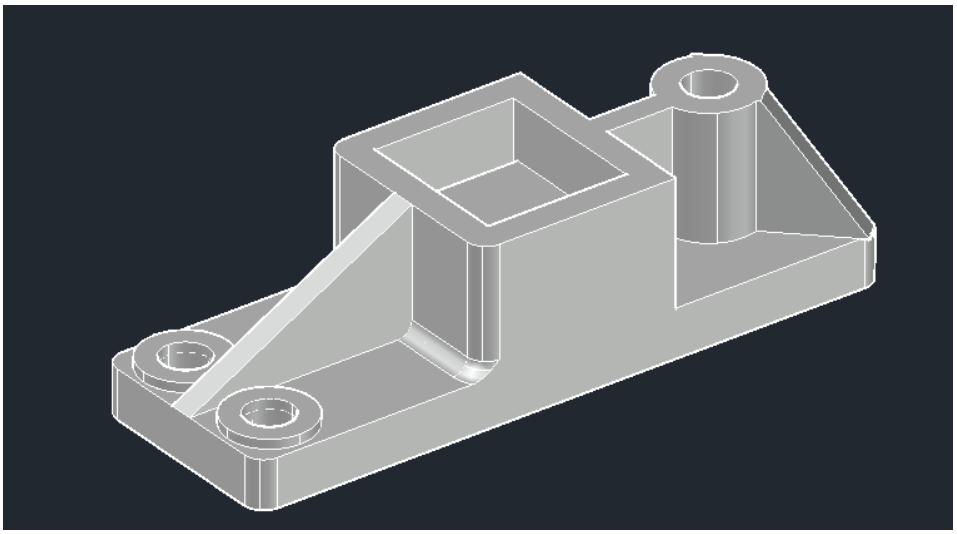
Assignment -4

Objective : Make orthographic sectional and isometric views of the given drawing .



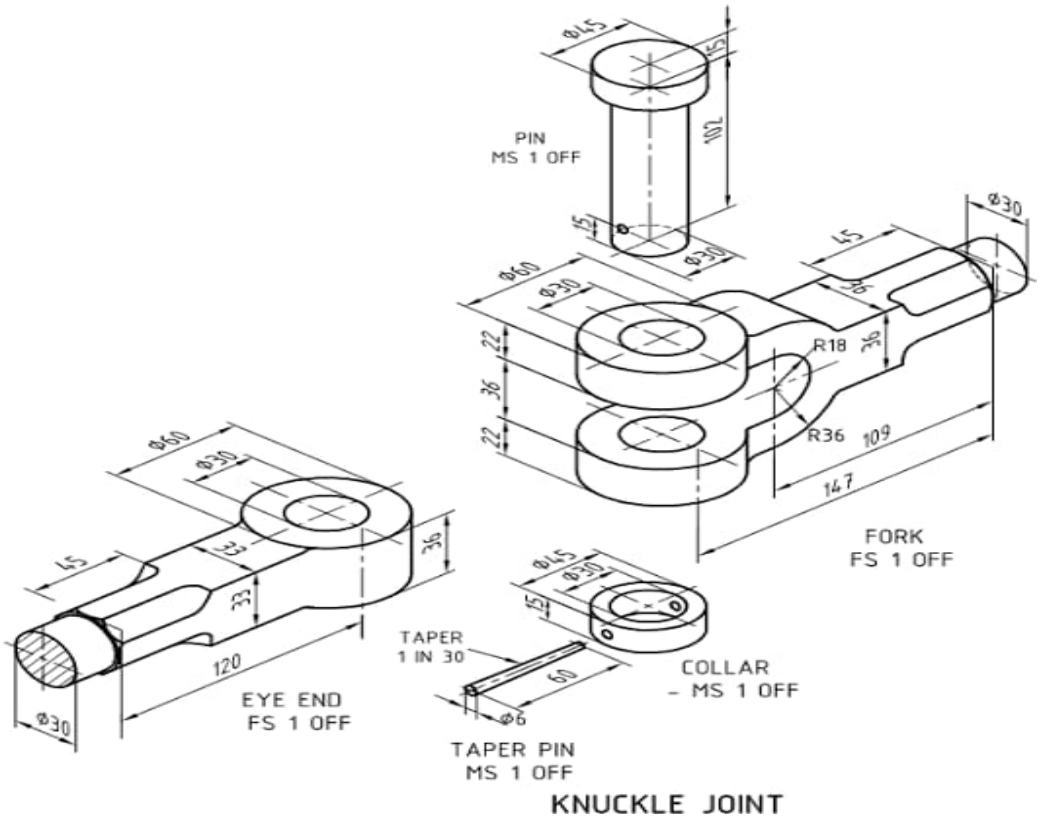
Commands used : line , offset , move , mirror , trim , ucs , wedge , presspul , extrude , center - diameter circle , center-radius circle.

Final 3D Model :



Assignment – 5

Objective : To create the knuckle joint assembly as a 3-D solid model using AutoCad software.



Introduction :

A knuckle joint is a mechanical joint used to connect two rods which are under a tensile load, when there is a requirement of small amount of flexibility, or angular moment is necessary. There is always axial or linear line of action of load.

At one end of the rod the single eye is formed and a double eye is formed at the other end of the rod. Both, single and double eye are connected by a pin inserted through the eye. The pin has a head at one end and at other end there is a taper pin or split pin. For gripping purpose, the ends of the rod are of octagonal forms. Now, when the two eyes are pulled apart, the pin holds them together.

Procedure :

1. Open AutoCad software.

2. Take a new file , name it knuckle joint.

3. Create one of the component , name it as part-1.

4. Use commands like circle , line , presspull , extrude , trim , move , copy , erase , union etc.

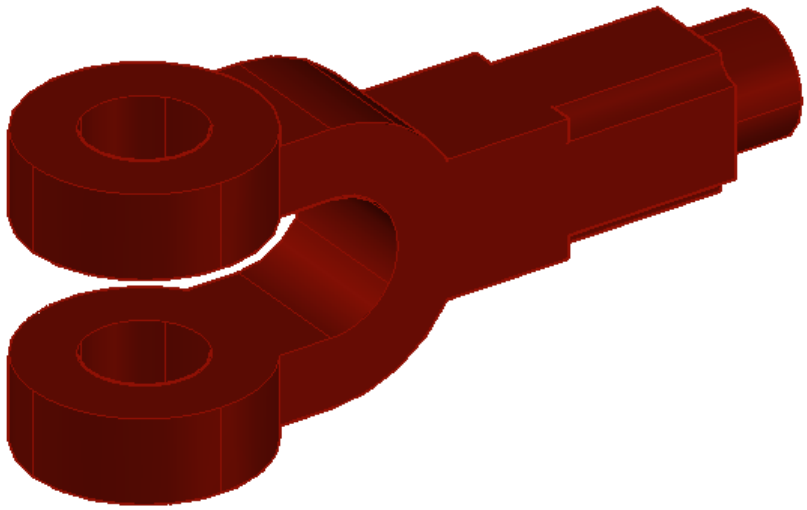
5. Repeat this procedure for all other parts.

6. After all components are made , open all parts and then assemble them by joints commands.

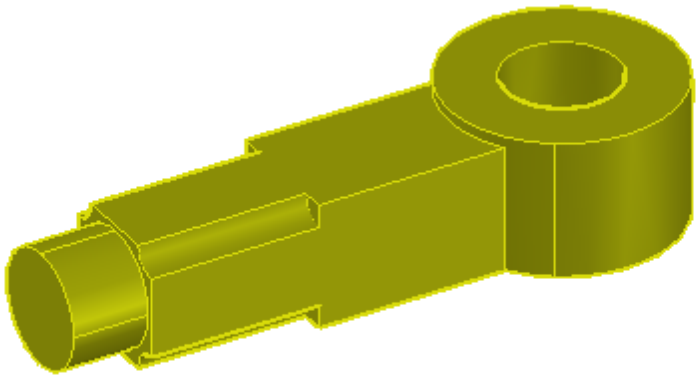
7. Save and exit.

Parts of the Knuckle Joint

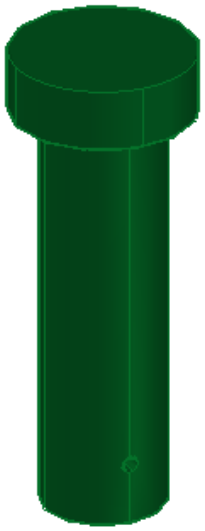
1. Fork –



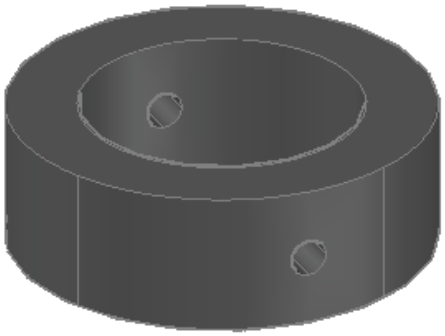
2. Eye end –



3. Pin –

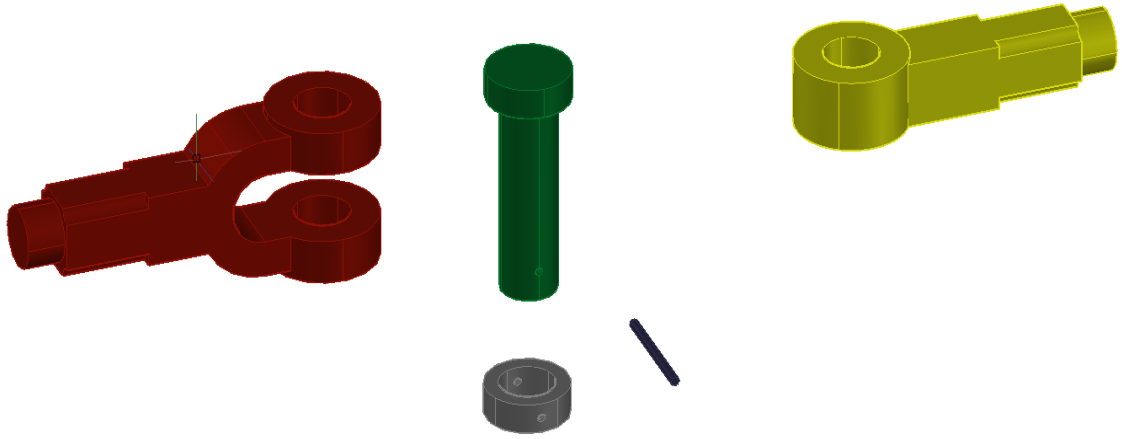


4. Collar –

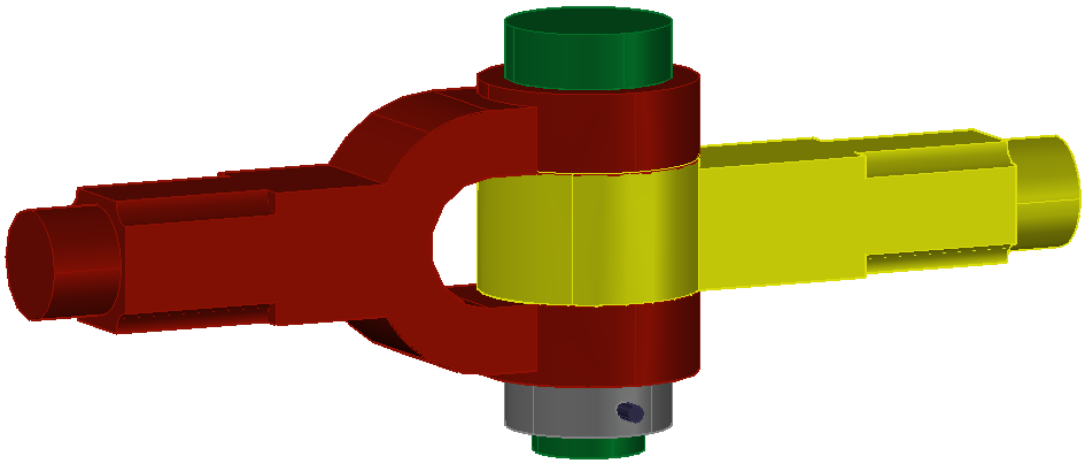


5. Taper pin –

All parts together –



Final Assembly –



Commands Used : line , center – diameter circle , presspull , extrude , subtract , union , trim , mirror , move , copy .

Final Project

Inline Four stroke engine

Inventor :

The four-stroke cycle was patented in 1862 by the French engineer Alphonse Beau de Rochas, but since Otto was the first to build an engine based upon this principle, it is commonly known as the Otto cycle. Because of its reliability, its efficiency, and its relative quietness, Otto's engine was an immediate success.

Intoduction :

A straight-four engine is a four-cylinder piston engine where cylinders are arranged in a line along a common crankshaft.

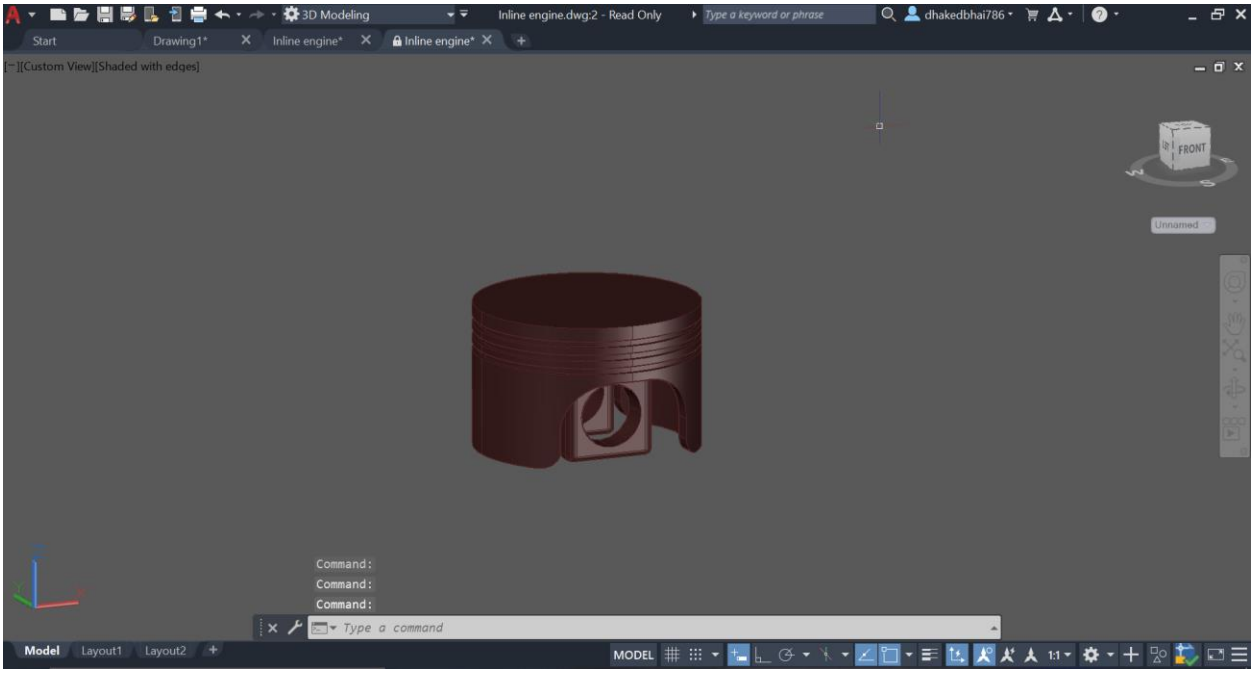
The vast majority of automotive four-cylinder engines use a straight-four layout and the layout is also very common in motorcycles and other machinery. Therefore the term "four-cylinder engine" is usually synonymous with straight-four engines.

Application :

There are many application and usage of straight four-stroke engine such as in production cars The smallest automotive straight-four engine was used in the 1963–1967 Honda T360 kei truck and has a displacement of 356 cc (21.7 cu in), while the largest mass-produced straight-four car engine is the 1999–2019 Mitsubishi 4M41 diesel engine which was used in the Mitsubishi Pajero and has a displacement of 3.2 L (195 cu in). Inline four-stroke engines used in racing also in past. Some buses and trains with straight engines have their engines mounted with the row of cylinders horizontal. This differs from a flat engine because it is essentially an inline engine laid on its side. Underfloor engines for buses and diesel multiple units (DMUs) commonly use this design. Such engines may be based on a conventional upright engine with alterations to make it suitable for horizontal mounting. Many straight engines, in the stricter sense, have been produced for aircraft, particularly from the early years of aviation and through the interwar period leading up to the Second World War. Straight engines were simpler and had low frontal area, reducing drag, and provided better cockpit visibility.

All Components

1. Piston :



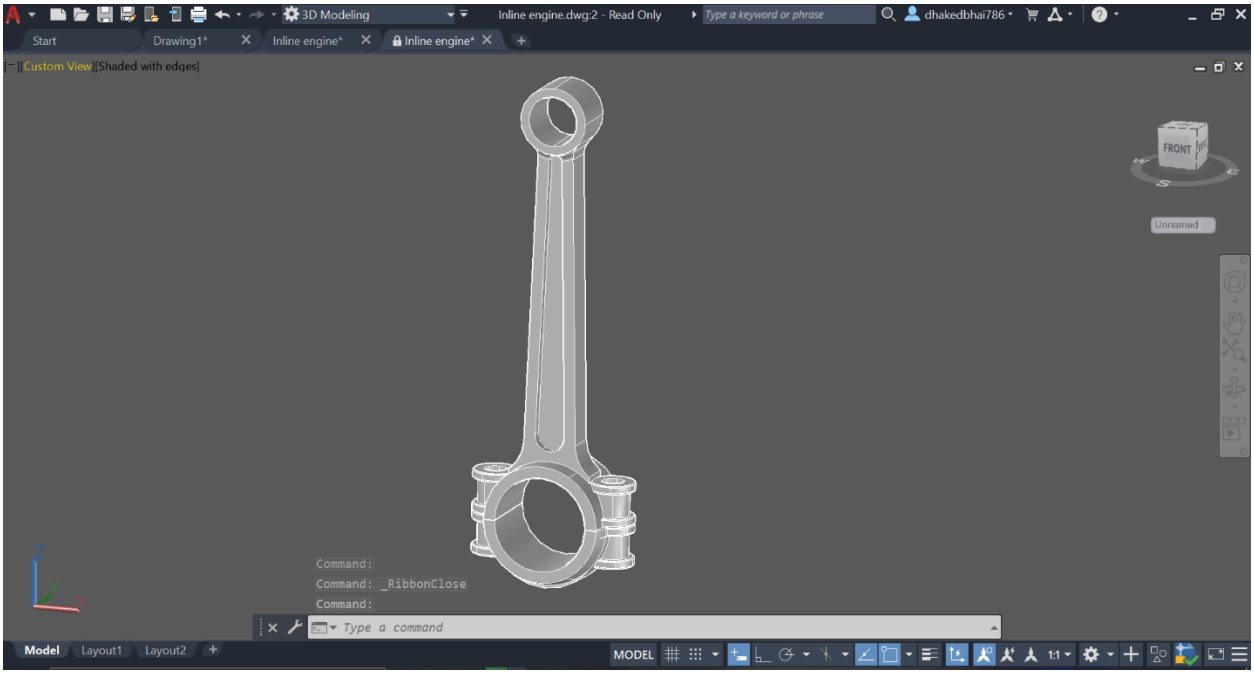
Function :

A piston is a moving disk enclosed in a cylinder which is made gas-tight by piston rings. The disk moves inside the cylinder as a liquid or gas inside the cylinder expands and contracts. A piston aids in the transformation of heat energy into mechanical work and vice versa. Because of this, pistons are a key component of heat engines.[2] Pistons work by transferring the force output of an expanding gas in the cylinder to a crankshaft, which provides rotational momentum to a flywheel. Such a system is known as a reciprocating engine.

A piston must follow a cyclical process in order for it to continuously convert heat energy to work, and there are many ways to complete this cycle. For example:

- By inputting heat to the gas inside the cylinder, the gas will expand increasing the volume in the cylinder and provide useful work.
- By removing heat from the cylinder, the gas's pressure will decrease, allowing it to be compressed more easily.
- By inputting work to the piston, the piston will compress back to its initial state, ready to perform the cycle once again.

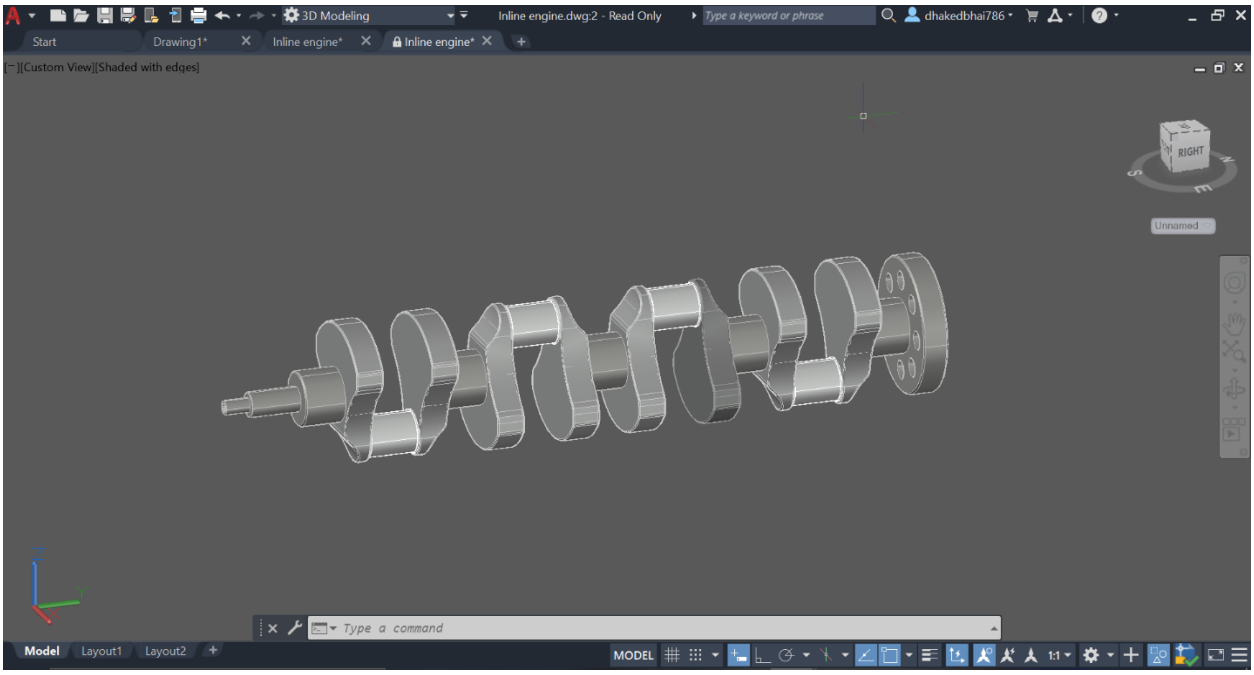
2. Connecting rod :



Function :

The connecting rod provides the mechanical linkage between piston and crankshaft and must exhibit properties of high strength, low inertial mass, and uniformity of mass with the other connecting rods attached to the crankshaft. Coupling to the crankshaft is achieved through solid journal bearing half shells inserted on both sides of the split large end. Coupling to the piston is usually through a hardened steel gudgeon pin through the piston body. In recent years, excellent connecting rod fits at the split large end have been achieved through controlled fracture of the connecting rod large end (Olaniran and Stickels 1993). The connecting rod large ends are often threaded directly such that the split portion may be attached during assembly with the crankshaft. Materials for connecting rods have included powder metallurgy steels, which are formed into an initial shape then forged to near final dimension, as well as medium carbon steels, which develop superior strength either through separate heat treating processes or by controlled cooling following the forging step. Racing engines may utilize titanium alloys such as Ti–6Al–4V for connecting rods in order to achieve a high ratio of strength to mass of the part.

3. Crankshaft :



Function :

A crankshaft is a shaft driven by a crank mechanism, consisting of a series of cranks and crankpins to which the connecting rods of an engine is attached. It is a mechanical part able to perform a conversion between reciprocating motion and rotational motion .

Procedure :

1. Start AutoCad and save the folder as Straight four engine or Inline engine assembly .

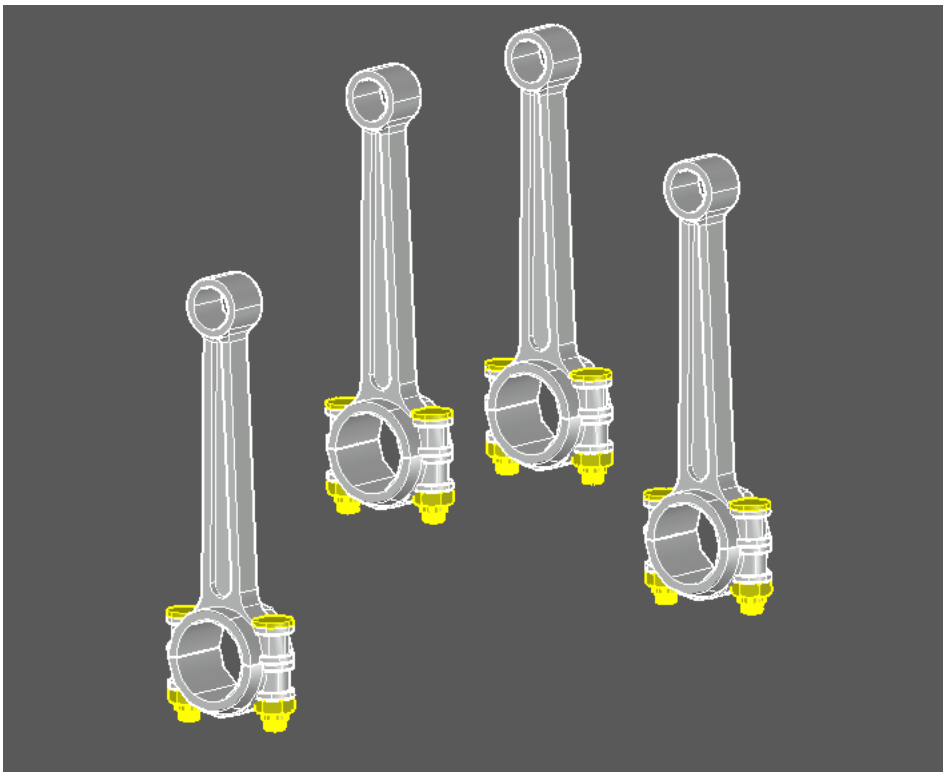
2. At first design the piston with proper dimensions .

3. Then moving to the other parts and create connecting rod of proper dimensions.

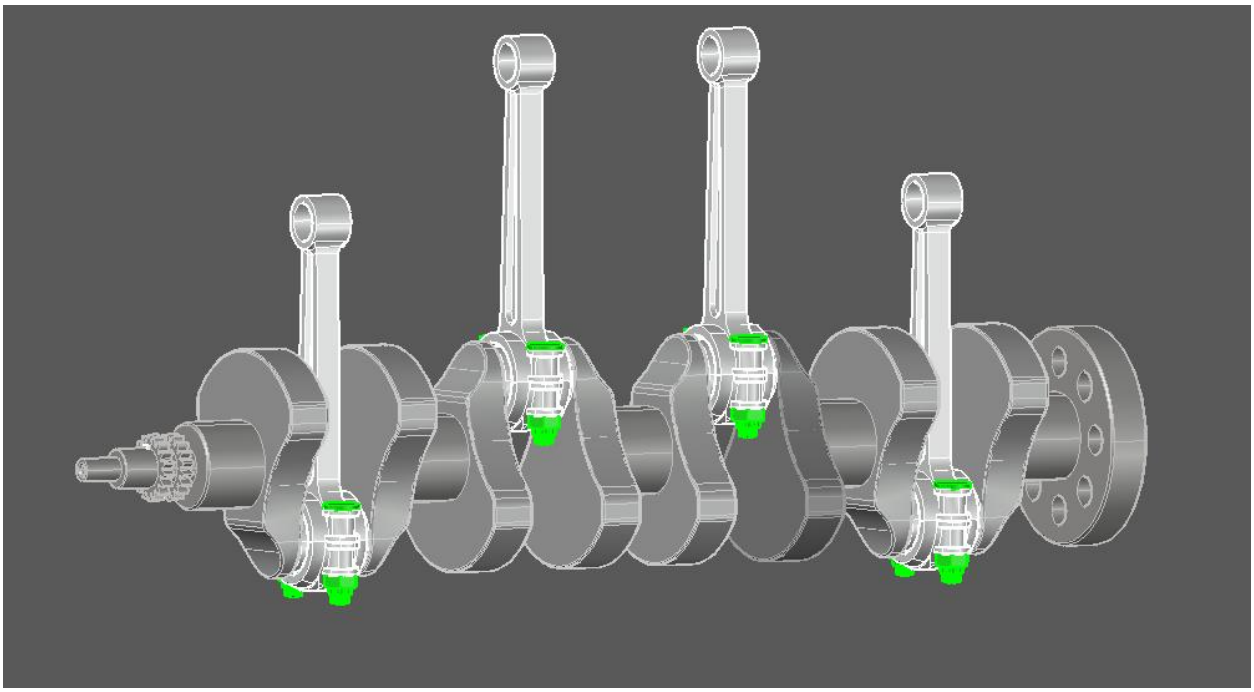
4. Then we start to crate the main part of the engine crankshaft . We create flywheel ,crank pin , crank webs , counter weight , keyway and main journals.

5. Now create 4 copies of the piston .

6. Create 5 copies of connecting rod as well with nuts and bolts in it.

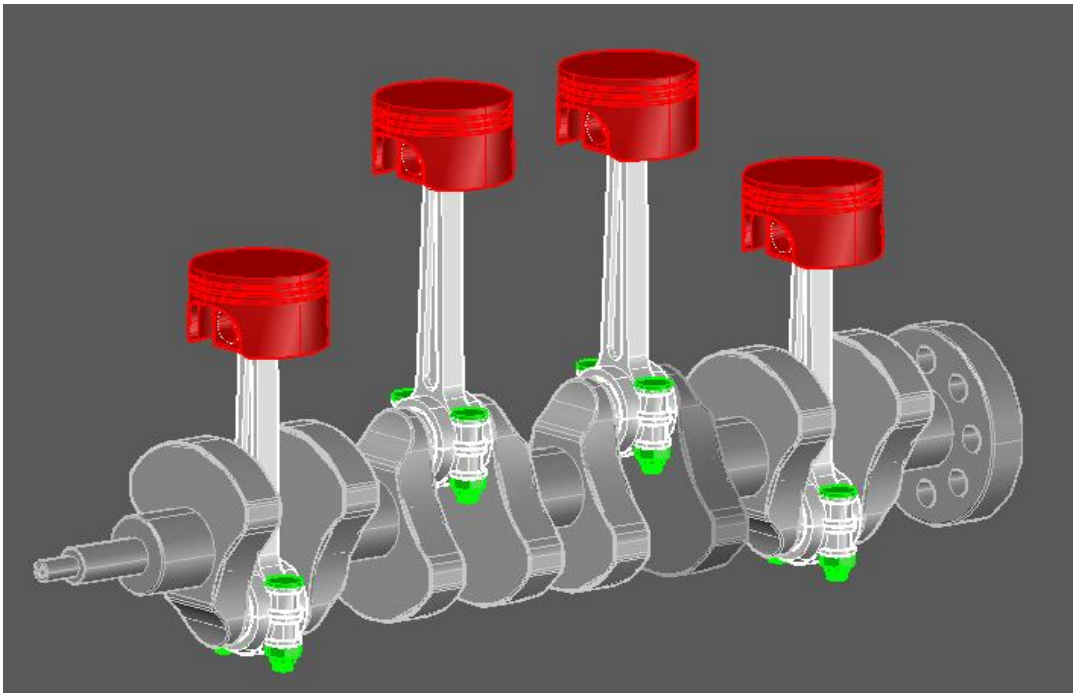


7. Mount the connecting rod on cranckshaft and fix it with nuts and bolts.



8. Now connect the pistons and final assembly is ready .

Final Assembly :



Commands used :

Centre-diameter circle, centre-point rectangle, three point-arc, two-point circle, extrude, presspull , union , subtract , joint, mirror , copy/move, trim, line, material appearance, 3D rotate , ucs , colors, revolve, motion etc.

Conclusion

What I concluded from this report is that AutoCad is very useful software in designing of various tools and equipment in our day to day life . We learnt a lot about how to apply its basic features and how to use it in creating various models according to our required dimensions.

In this internship program we studied about the designing software from Autodesk . During the 6 week time we completed various assignments on sketching, modelling of various tools .

References

1. www.google.com
2. www.autodesk.in
3. www.quora.com
4. www.youtube.com
5. www.grabcad.com