ENGG2020
FUNDAMENTALS OF EMBEDDED SYSTEM DESIGN

LECTURE 1: ENGINEERING DRAWING I

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WHY ENGINEERING DRAWING?

- Why do we need to know engineering drawing in the embedded system design?
  - In designing new embedded system, we may need some new parts which may not be available in the market
  - During the process of our design, these new parts may be changed accordingly
  - For the new embedded system, design the casing is also important in product design
  - By using engineering drawing techniques, we can create our parts/casings our own, and test it by 3D printing
- Therefore, engineering drawing can help to realize our rapid prototyping of our embedded system design

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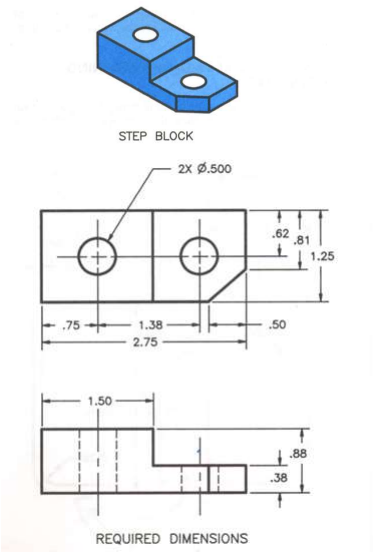
ENGINEERING DRAWING

- An engineering drawing is a type of technical drawing used to fully and clearly define the requirements for engineered items
- A formal and precise way for communicating information about the shape and size of physical objects
- A mean for specifying the precision of physical objects
- It is also a legal document. If the drawing is wrong, it is the fault of the engineer.



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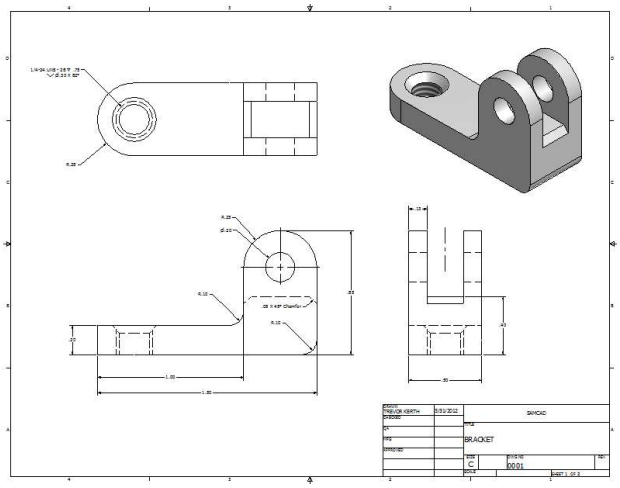
EXAMPLES OF ENGINEERING DRAWING



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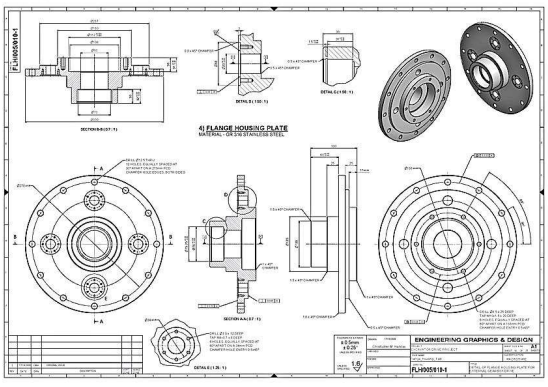
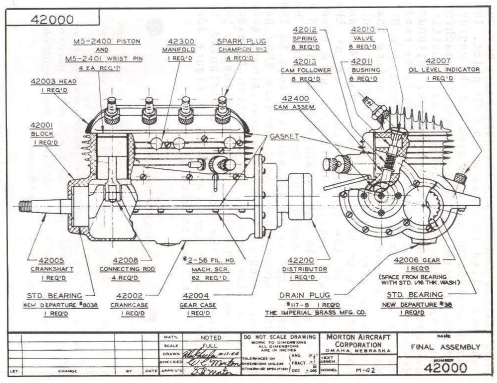
EXAMPLES OF ENGINEERING DRAWING





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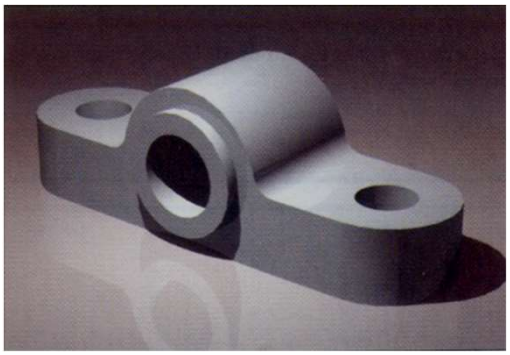
GRAPHIC LANGUAGE

- Graphic language in engineering applications uses lines to represent the surfaces, edges, and contours of objects
- The language is known as drawing or drafting
- A drawing can be done using freehand, instruments, or computer methods



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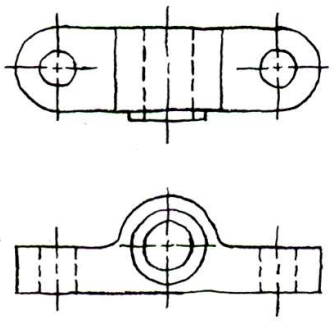
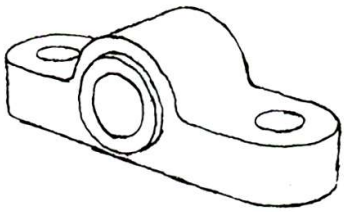
FREEHAND DRAWING

- The lines are sketched without using instruments other than pencils and erasers





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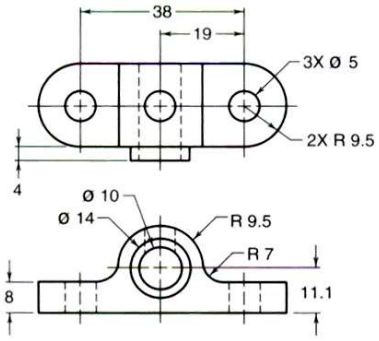
INSTRUMENT DRAWING

- Instruments are used to draw straight lines, circles, and curves concisely and accurately
- The drawings are usually made to scale



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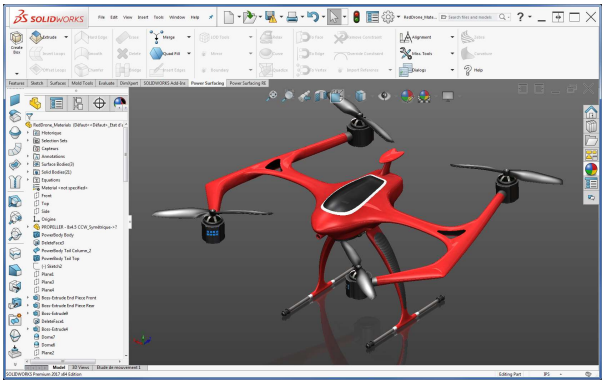
COMPUTER DRAWING

- The drawings are usually made by computer software, such as AutoCAD, SolidWorks, Engineer Pro, etc.



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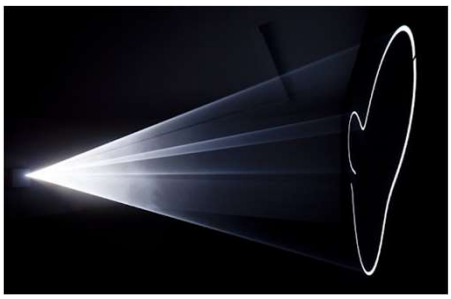
PROJECT THEORY

- The projection theory is used to graphically represent 3D objects on 2D media, such as paper or computer screen
- The project theory is based on two variables:
  - Line of sight
  - Plane of projection



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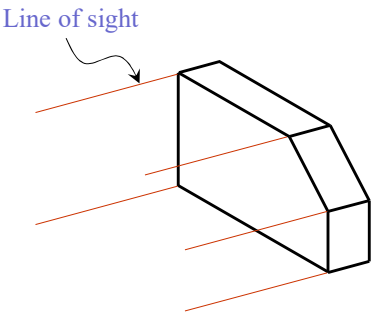
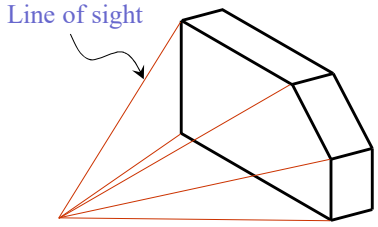
LINE OF SIGHT

- LOS is an imaginary ray of light between an observer's eye and an object

Parallel projection



Perspective projection



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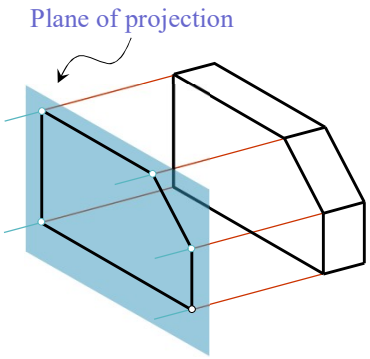
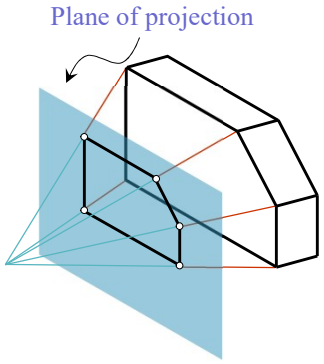
PLANE OF PROJECTION

- The image is produced by connecting the points where the LOS cross the projection plane

Parallel projection



Perspective projection



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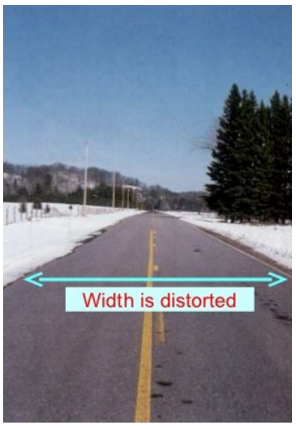
PROBLEM OF PERSPECTIVE PROJECTION

- Perspective projection is not used by engineer for manufacturing of parts, because…
  - It is difficult to create
  - It does not reveal exact shape and size



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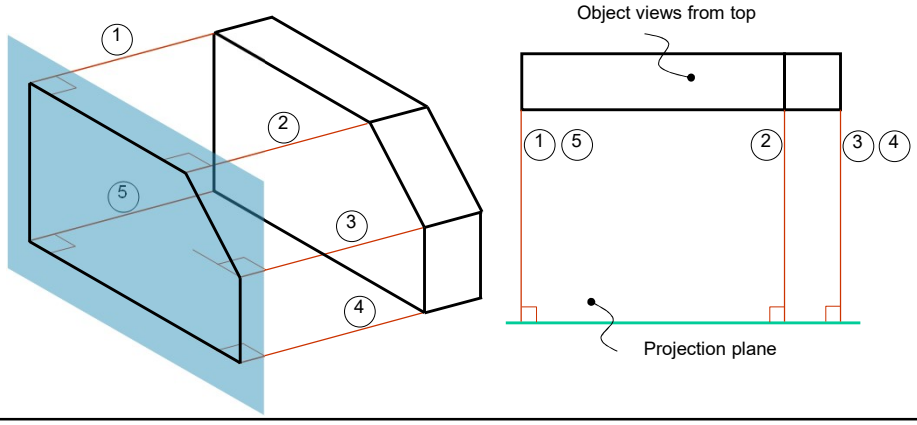
ORTHOGRAPHIC PROJECTION

- Orthographic projection is a parallel projection technique in which the parallel lines of sight are perpendicular to the plane of projection



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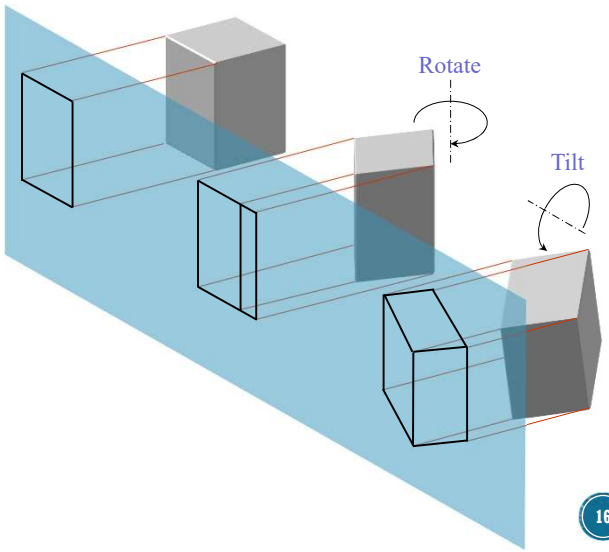
ORTHOGRAPHIC VIEW

- Orthographic view depends on relative orientation of the object to the line of sight



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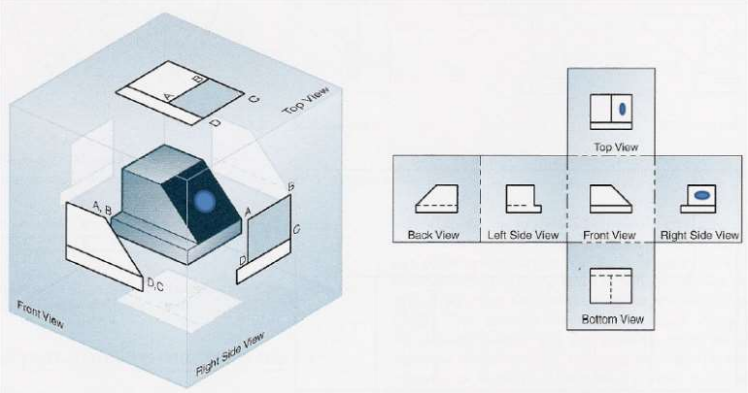
MULTIVIEW PROJECTIONS

- Project an object from six principal directions (front, back, top, bottom, left, & right)



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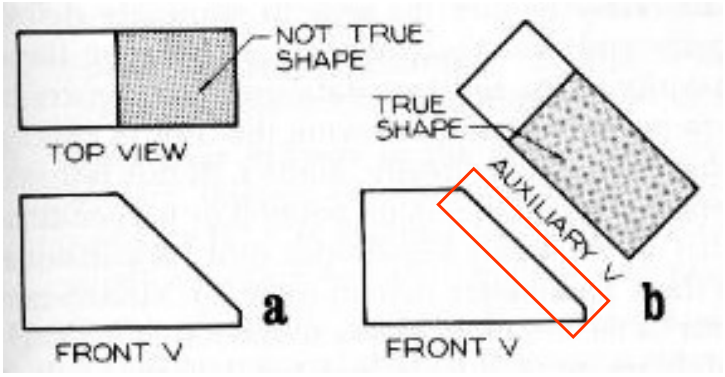
AUXILIARY VIEWS

- Used to shown true dimensions of an inclined plane



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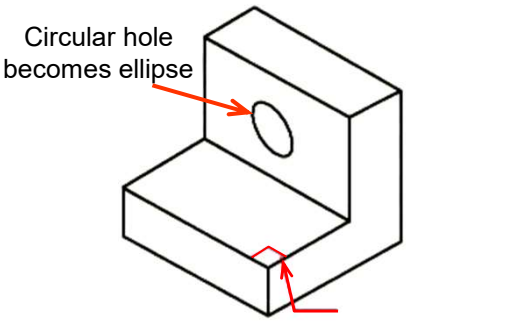
ISOMETRIC DRAWING

- Represent 3D objects by a 2D view in the projection in which the coordinate axes appear equally foreshortened
- It is easy to understand the 3D shape
- However, the project causes shape and angle distortions



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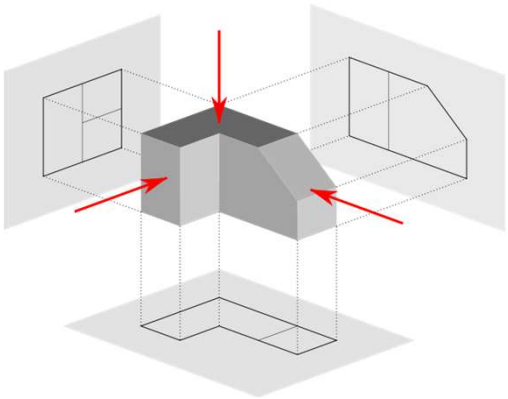
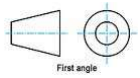
STANDARD ON PLACEMENT OF VIEWS – FIRST ANGLE PROJECTION

- Directly project images along the line of sight
- Front view is put at the middle
- Top view is put at the bottom
- Right view is put on the left





ISO standard
Used in Europe, etc.

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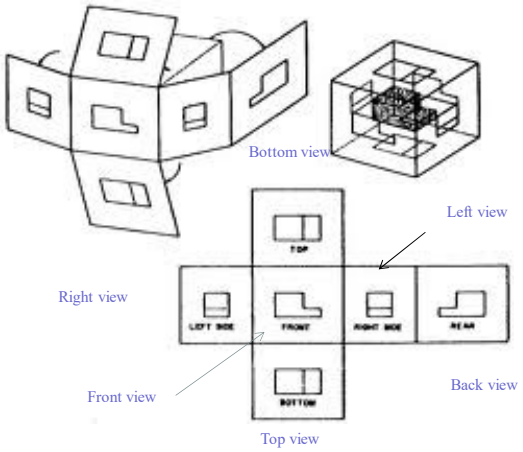
STANDARD ON PLACEMENT OF VIEWS – FIRST ANGLE PROJECTION



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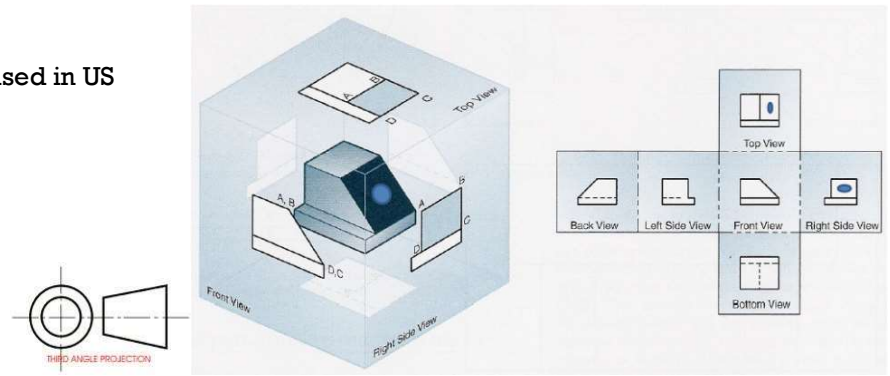
STANDARD ON PLACEMENT OF VIEWS – THIRD ANGLE PROJECTION

- The position of the viewpoint and location of the projection view are the same
  - Right side view is located at right
  - Left side view is located at left
- Mainly used in US



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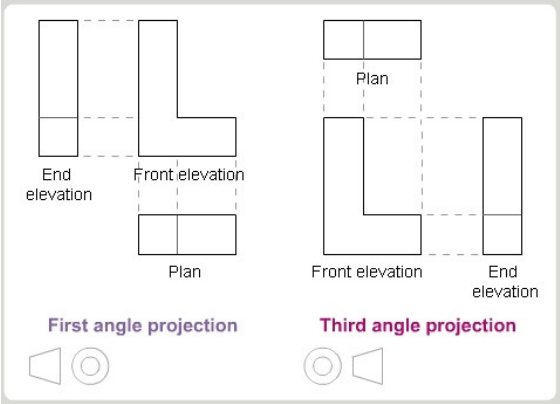
FIRST VS THIRD ANGLE PROJECTIONS

- Different signs to represent the standard of the viewing angles



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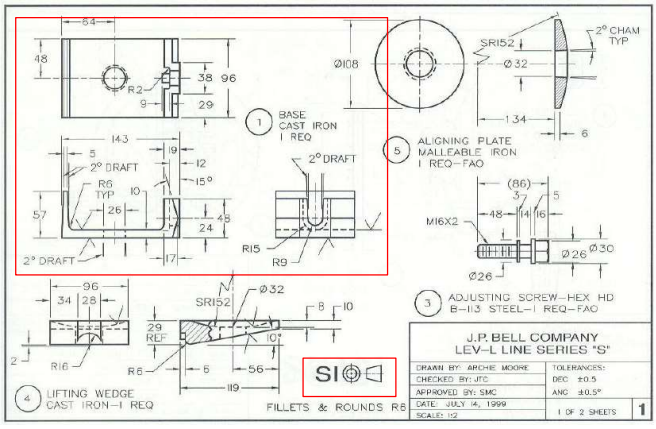
EXAMPLE OF REPRESENTATION



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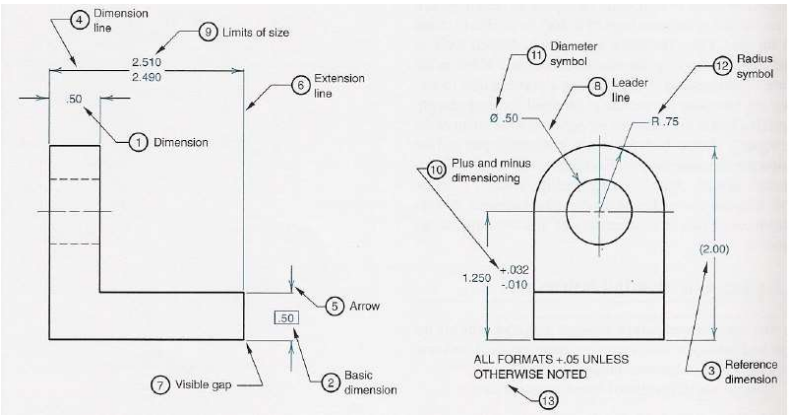
DIMENSIONING AND UNITS

- Dimensions in a drawing provides the necessary information for fabricating a part



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SOLIDWORKS

- A Computer Aided Design (CAD) software
- To create 3D design for products or parts
- To create engineering drawings for communications and manufacturing
- To analyze the design

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FIRST LOOK AT SOLIDWORKS

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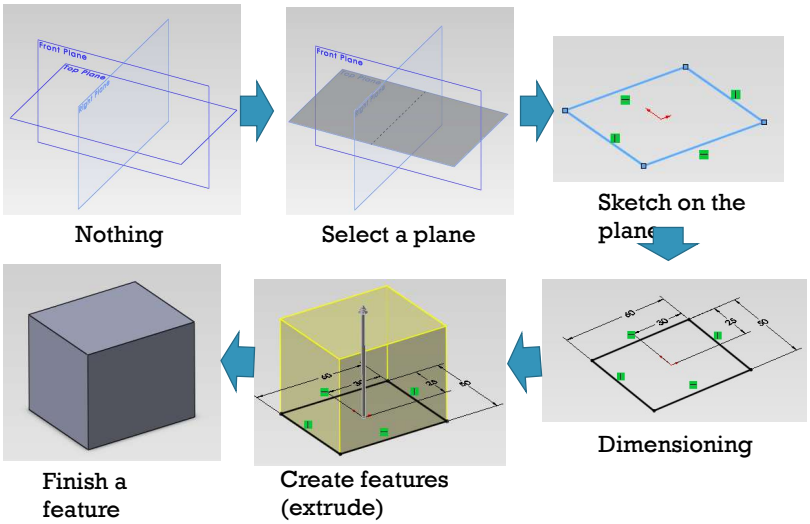
BASIC STEPS



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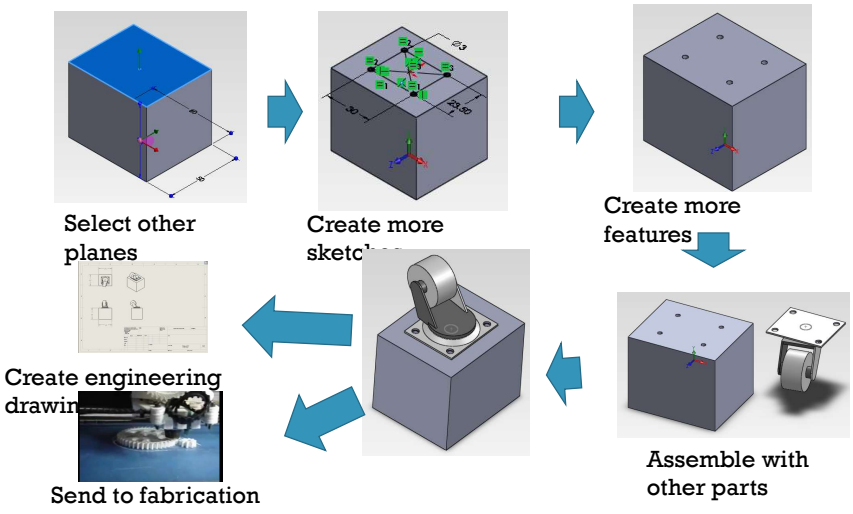
BASIC STEPS



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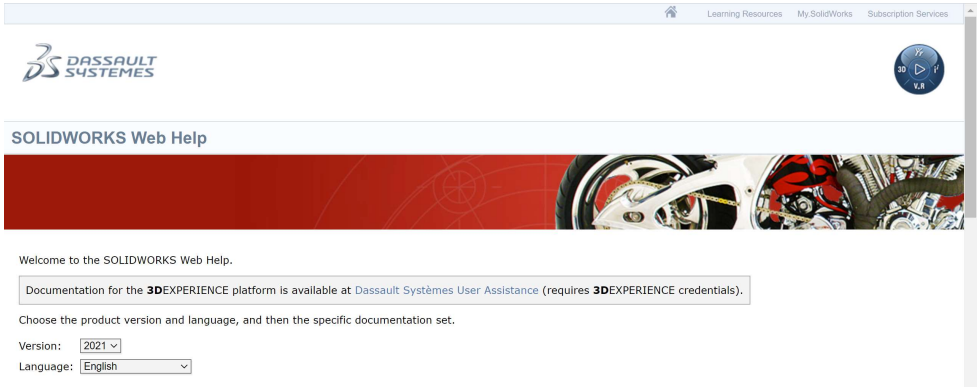
SOLIDWORKS REFERENCE (ONLINE)

- http://help.solidworks.com/HelpProducts.aspx



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ANY QUESTIONS ?

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