SECTOR

CAPITAL GOODS AND MANUFACTURING

COURSE

MECHANICAL ENGINEERING CAD

TRAINING PROVIDER:

AutoCAD Course Overview – TNSDC (TN Skill Government Scheme)

Course Title : AutoCAD (2D & 3D Drafting for Engineering Applications).

Conducted by : Tamil Nadu Skill Development Corporation (TNSDC) – under TN Skill Mission.

Duration : 510 Hours.

Daily Training : 6 Hours per day.

Approx. Course Length : Around **12 weeks (3 months).**

Course Objectives:

- To train participants in professional 2D and 3D CAD drafting for engineering and industrial applications.
- To develop job-ready skills for roles like AutoCAD Draughtsman, Design Assistant, CAD Technician, and Mechanical/Architectural Draftsman.
- To provide hands-on experience on industry-standard AutoCAD software aligned with TNSDC skill standards.

Certification:

- On completion and passing the final assessment, participants receive a **TNSDC Skill Certificate** recognized by the Government of Tamil Nadu.

- Certificate includes course duration (500 hrs), grade obtained, and job role code (as per NSQF).

Career Opportunities:

After successful completion, trainees can work as:

- AutoCAD Draftsman (Mechanical/Civil/Electrical)
- CAD Technician / Design Assistant
- BIM Assistant (with further training)
- Production Drawing Assistant
- Project Drafting Executive in industries, construction firms, or design consultancies.

Week 1: Introduction & Drawing Basics:

Focus Topics:

- AutoCAD interface, workspace setup.
- Drawing units, limits, coordinate systems.
- Line, circle, arc, polygon, rectangle, erase, zoom, pan.
- Understanding orthographic projection and scales.

Daily Practice: Simple 2D geometric shapes.

Weekly Assessment:

Draw a basic 2D mechanical plate using line, circle, and arc commands (with dimensions).

Week 2: Editing & Object Properties:

Focus Topics:

- Modify commands: move, copy, rotate, mirror, offset, trim, extend.
- Object snap (OSNAP), object tracking, grips.
- Layers, color, line types, line weight, properties palette.

  Daily Practice: Layer-based drawing management.

Weekly Assessment:

Redraw a given 2D mechanical part using 3 layers, proper dimensions & line weights.

Week 3: Annotation & Dimensioning:

Focus Topics:

- Dimension styles, leaders, tolerances.
- Text styles, multiline text, annotation scaling.
- Title blocks, borders, and templates.

  Daily Practice: Create title block with company and student info.

Weekly Assessment:

Prepare a fully annotated 2D drawing sheet with dimensions and title block.

Week 4: Blocks, Attributes & Layouts:

Focus Topics:

- Create/edit blocks, insert, redefine.
- Attribute definitions, extraction.
- Layouts, viewports, plotting, paper space.

Daily Practice: Symbol library creation.

Weekly Assessment:

Create an assembly drawing using blocks and print it to scale (PDF or plot).

Week 5: Advanced 2D Drafting:

Focus Topics:

- Hatch, gradient, array, polyline editing.
- Xref (external references), drawing management.
- Complex drawings – floor plan / mechanical assembly.

Daily Practice: Redraw a detailed plan using layers and hatches.

Weekly Assessment:

Draw a mini-project (e.g., machine base or building plan) with hatching and annotation.

Week 6: Isometric Drawing & Section Views:

Focus Topics:

- Isometric snap and grid.
- Isometric projection techniques.
- Creating sectional views and detailed views.

Daily Practice: 3D-like isometric exercises in 2D mode.

Weekly Assessment:

Create an isometric view of a mechanical component from orthographic projections.

Week 7: 3D Modeling Basics:

Focus Topics:

- 3D workspace setup, UCS, view controls.
- Solid primitives (box, cylinder, cone, sphere).

- Boolean operations (union, subtract, intersect).

  Daily Practice: Practice with solid primitives.

Weekly Assessment:

Model a 3D mechanical part using primitives and Boolean tools.

Week 8: 3D Editing & Transformations:

Focus Topics:

- 3D editing: move, rotate3D, align, fillet, chamfer.
- Presspull, extrude, revolve, sweep, loft.
- UCS management for 3D objects.

  Daily Practice: Transforming 3D solids into assemblies.

Weekly Assessment:

Create a 3D assembly of at least 4 parts using extrude & revolve commands.

Week 9: Visualization & Rendering:

Focus Topics:

- Visual styles, materials, lights, cameras.
- Rendering and export techniques.
- Sectional 3D drawings, viewports in layouts.

  Daily Practice: Apply colors, materials, lights to models.

Weekly Assessment:

Render a 3D model with proper material, lighting, and perspective view.

Week 10: Engineering Drawing Standards & Detailing:

Focus Topics:

- Tolerances, GD&T symbols, text standards.
- BOM (Bill of Materials) generation.
- Converting 3D to 2D drawings.

  Daily Practice: Create 2D projection from 3D model.

Weekly Assessment:

Prepare a detailed drawing (top, front, side views) with dimensions and title block.

Week 11: Project Work:

Focus Topics:

- Complete design of a mechanical component / small assembly / building plan.
- Apply all learned 2D & 3D techniques.
- Peer review & corrections.

Daily Practice: Work on full project drawing.

Weekly Assessment:

Submit complete project drawing (with 2D plan, 3D model, and print layout).

Week 12: Review, Presentation & Final Assessment:

Focus Topics:

- Revision of all commands.
- Printing and documentation.
- Portfolio preparation (soft & hard copy).
- Mock test and viva.

Weekly Assessment:

Final evaluation by instructor (theory + practical).

Submit portfolio for certification and grading.

COMMANDS

2D Modeling Primitives:

Line Commands:

Line – L.

XLine - XL (Infinite line).

Rayline - Ray (Start point with infinite line).

Live type - LT (visual appearance of line).

Line weight - LW (Thickness of the line).

Line type Scale - LTS (Scaling the Visual appearance of line).

Multiline - ML (Drawing a line).

Multiline Style - MLST (Modify the "ML" Command).

Polyline - PL (Create a single or multi-line into single compound).

Modifying Commands:

Trim - Tr (Remove excessive part of the drafting).

Array - Ar (To create multiple copies of object in regular Pattern).

Move - M (Relocate the object in in a new position).

Mirror - Mi (Creates a mirrored Copy of Selected object).

Fillet - F (Create Curved Surface between edges).

Off set - 0 (Create parallel copies of existing objects a specified distance).

Copy - Co (Create Copies of existing objects).

Rotate - Ro (Rotate the object at a specified angle).

Overkill -Ov (Remove the overlapping objects).

Chamfer - Cha (Create an angled edge of the edge).

Explode - X (Break down Complex objects into their Individual Components).

Join - J (Join the individual Components into single Component).

Extend - Ex (To lengthen existing objects to the edges of others).

Stretch - Str (Used to extend or shrink objects).

Break - Br (To split an object into two or more separate objects at specifiied points).

Polygon - Pol (To Create the object using no. of faces).

Color - Col (To apply Color on the object).

Quick selection - QSE (To select the object with same properties).

Filter - Fi (It's same of QSE).

Group - G (To Create group with multiple objects).

Ungroup - UNG (Ungroup the group elements).

Match properties - MA (To apply same properties to others).

Dimension – D (To modify dimension related properties).

Drafting Setting - DS (To setting the drafting properties).

Erase -E (Erase the objects).

Layer - La (Separate the drawing by layer by layer).

Text - DT (Adding text).

Text Style - ST (Modifying the text Style).

Multitext - MT (Adding text & Modified).

Spellcheck - Sp (Correcting the spelling).

Hatch - H (To used to fill enclosed areas with a pattern, solid color, or gradient).

Hatch Edit - HE (Editing the hatch pattern).

Boundary - Bo (Closed shapes are Created a Object).

To Create objects:

Block - B (To save object properties & use it).

Block Insert - I (Insert the block).

Block edit - Be (Edit the block).

Table -Tb (Specify window).

Table Style - Ts (Modified the table Text).

Circle – C.

Rectangle – Rec.

Ellipse – El (An oval shape).

Polygon – Pol (Creates a closed, equilateral, and equiangular shape with 3 to 1024 sides).

Toggle Drawing Modes:

F1 - Display help.

F2 - Toggle text screen.

F3 - Toggle Object Snap mode.

F4 - Toggle 3D Object Snap.

F5 - Toggle Isoplane.

F6 - Toggle Dynamic Ucs.

F7 - Toggle grid mode.

F8 - Toggle ortho mode.

F9 - Toggle Snap mode.

F10 - Toggle polar mode.

F11 - Toggle Object Snap tracking.

F12 - Toggle dynamic input mode.

Parametric Tab: (First point is fixed & Second is point movable).

Coincident (To join the point).

Collinear (Two or more objects lie on the same Straight line).

Concentric (To fix the Center of the circle to another Circles).

Fix (Do not move the Object).

Parallel (To Constrain the parallel lines).

Prependicular (Lines that intersect at 90°).

Horizontal (To Changes line direction to horizontal).

Vertical (To Changes line direction to vertical).

Tangent (Line is contact with radius of the circle).

Symmetric (Equal distance between object with respect to axis).

Equal (Same Geometric properties to apply other objects).

3D Modeling Primitives:

Box (Creates a 3D solid box with specified dimensions (length, width, height) or by defining two opposite corners).

Sphere - Sph (Creates a 3D solid sphere by specifying its center point and radius).

Cylinder - Cyl (Creates a 3D solid cylinder by defining its center point, radius, and height).

Cone (Creates a 3D solid cone by defining its center point, radius, and height).

Donut - Don (Creates a 3D solid torus (donut shape) by defining its center, radius of the tube, and radius of the torus).

Wedge - We (Creates a 3D solid wedge by defining its dimensions).

Pyramid - Pyr (Creates a 3D solid pyramid by defining its base and height).

Creating 3D Objects from 2D Profiles:

Extrude - Ext (Extends a 2D object (like a polyline or circle) into 3D space to create a solid or surface).

Revolve - Rev (Creates a 3D solid or surface by revolving a 2D profile around a specified axis).

Sweep - Swe (Creates a 3D solid or surface by sweeping a 2D profile along a path).

Loft - Lof (Creates a 3D solid or surface by lofting (blending) between two or more cross-sectional profiles).

Presspull - Pres (Interactively creates 3D solids or surfaces by pressing or pulling enclosed boundaries or 3D faces).

Boolean Operations (Solid Editing):

Union - Uni (Combines two or more 3D solids into a single solid).

Subtract - Sub (Removes one 3D solid from another).

Intersect - Int (Creates a new 3D solid from the overlapping volume of two or more solids).

SOLIDEDIT - Solide (Provides various tools for editing solid objects, including faces, edges, and bodies).

3D Manipulation and Viewing:

3DMove – 3dm (Moves selected 3D objects in 3D space).

3DRotate – 3dr (Rotates selected 3D objects around an axis in 3D space).

3DScale – 3ds (Scales selected 3D objects uniformly or non-uniformly).

UCS (Defines a User Coordinate System, allowing you to work on different planes in 3D).

View - V (Sets a specific viewpoint or saved view in 3D space).

3DOrbit – 3do (Interactively rotates the view of a 3D model).

Other Useful 3D Commands:

Polysolid - Polys (Creates a 3D wall-like object with a specified height and width).

Mesh (Creates various types of 3D mesh objects).

Render - Rr (Creates a photorealistic image of a 3D model).

Materials - Mat (Manages, applies, and modifies materials for rendering).