Syllabus for AutoCAD Junior Draftsman

Course Name	**AUTOCAD JUNIOR DRAFTSMAN, V2**
Course Code	**STC-CON/ACJD/0809, V2**
Occupation	AutoCAD Junior Draftsman
Job Description	CAD is the primary way in which drafters develop plans, drawings and sketches. Using AutoCAD software, created by Autodesk Inc., drafters prepare a visual depiction of a product to be constructed. Production and construction workers, including engineers, surveyors, architects and scientists, use CAD images to create plans to build and manufacture everything from building to toys to spacecrafts. AutoCAD drafters also have a working knowledge of traditional drafting methods.
Anticipated Volume of Training	390 Hrs (Theory:90 Hrs + Practical:180 Hrs + Employability Skill: 60 Hrs. + OJT 60 Hrs.)
Trainees' Entry Qualification	Class 8 pass and pursing continuous regular schooling, OR Class 8 Pass with 1 year experience, OR Class 8 Pass + ITI, OR Class 10 Pass OR previous relevant qualification of NSQF Level 2 with 1 yr experience
Trainers Qualification	BE/ B Tech in Civil Engineering / Mechanical Engineering / Architecture with 2 Yrs experience OR Diploma in Civil Engineering / Mechanical Engineering / Architecture with 4 Yrs experience OR ITI in draughtsman – Civil / draughtsman Mechanical with 5 Yrs experience.

Structure of Course:

Module No.	Outcome	Theory (Hrs)	Practical (Hrs)	OJT (Hrs)	Total (Hrs)
1	Perform computer application with a knowledge of hardware and software and create drawing in Auto CAD using commands and tools.	10	20		30
2	Demonstrate the use of layer property management, different tools and commands that helps add information to text along with dimensioning the drafting.	20	40		60
3	Draw isometric projection and the application of isometric drawing (Plane and curvature block)	20	40		60
4	Explain the importance of geometric dimensions with tolerance, fundamental of attribute along with frequently used symbols, application of enquiry tools, layout, plotting, publishing, data exchanging & embedding in AutoCAD.	20	40		60
5	Demonstrate the use of 2D objects and modify them using the 3D commands along with different editing tools used for the same.	20	40		60
6	OJT			60	60
7	Employability skill 60 hrs				60
	TOTAL:	90	180	60	390

SYLLABUS:

Module No. 1: Perform computer application with a knowledge of hardware and software and create drawing in Auto CAD using commands and tools.

Theory Content:

Introduction to Computers and Windows Operating System

Advantages and applications of computers. Concepts of hardware and Software. Introduction to the functions of an operating system. Popular operating systems in use. Various input / output devices in use and features. Using scanner, printer and plotter. Knowledge of installation of application software.

Introduction to CAD (Computer Aided Design)

Introduction to CAD and advantage of CAD in engineering field. Identify the screen nomenclature of AutoCAD and discuss the main menu, screen menu command line, model space, layout Space and work space. Theory of drawing settings unit and limits, pan and zoom. Drafting settings – grid, polar tracking, object snap, 3D object snap and dynamic input.

Coordinate system, Function Key and File System

Theory of coordinate system - absolute coordinate system, relative coordinate system and polar coordinate system. Details description of function key. AutoCAD file creation, save and open existing drawing.

Theory of Drafting Tool

Details theory of line, polyline, circle, polygon, arc, rectangle, ellipse, elliptical arc, hatch, spline, construction line, multiline, multiline style, ray, point, divide, boundary, region, wipeout, revision cloud and measures options etc.

Theory of Modifying Tool

Details theory of move, rotate, trim, copy, mirror, fillet, chamfer, polar array, rectangular array, path array, erase, explode, offset, lengthen, edit polyline (fill on/off), edit spline, edit hatch, edit array, edit multiline, pdmode, grip editing, pdsize, align, break, point break and join. Object properties – Properties of windows, colour, linetype, linetype scale, line weight and match properties**.**

Practical Content:

Introduction to computers and windows operating systems.
Introduction to computers and windows operating systems. Create a new folder, add sub folders. Create applications files. Change the appearance of windows. Search files, sort files, copy files and shortcut folder and create shortcut icons on the desktop. Move files from removable disk. Create, save and print a document, worksheet and PDF files.

Project Content:

PROJECT-I
Working with MS Paint with 10 sketches

Introduction to CAD (Computer Aided Design)
Change the workspace-drafting and annotation. setting toolbar as per requirement. Use mouse buttons, menu, pan and zoom. Locate origin and set graphical limit of drawing space.
Use command from command line and also use command from menu bar and floating toolbar. Drag and drop figures from tool palettes.

Application of Coordinate system, Function Key and File System
Create 2D object drawing using coordinate system - absolute coordinate system, relative coordinate system and polar coordinate system. Apply the concept of function key in drawing and also use file creation, save and open existing drawing.

Application of Draw Toolbar
Draw 2D objects or create geometrical figure using line, polyline, circle, arc, rectangle, donut, ellipse, elliptical arc, hatch, gradient, boundary, hatch settings, fill or fill Mode, spline, construction line, ray, point, divide, boundary, region, wipeout, revision cloud and measures.

Modify Tool Application
Manage 2D objects or modify geometrical figure using commands move, rotate, trim, copy, mirror, fillet, chamfer, polar array, rectangular array, path array, erase, explode, offset, lengthen, edit polyline, edit spline, edit hatch, edit array, align, break, point break, and join. Apply the concept of object properties – properties of windows, colour, linetype, linetype scale, line weight and match properties.

Project Content:

Project-II
Draw 10 nos. Lamina drawing without dimensions

Module No. 2: Demonstrate the use of layer property management, different tools and commands that helps add information to text along with dimensioning the drafting.

Theory Content:

Layer Property Management
Theory of adding / removing Layers. Layer status new property filter. New group filter. Layer status Manager. Line type and Plot.

Annotation Tools
Details theory of text, text setup style, setting single line text, multiline text, inserting text, scale text, arc text, Mirrtext, edit text, spell, table, table Style and table edit.

Template Management
How to use standard templates and setup new templates, inserting drawings sheet on job.

Dimensions
Theory of dimensions - linear, aligned, radius, diameter, angle, arc length, continuous, baseline, dimensions space, dimensions break, inspection, jogged radius, ordinate dimensions, leader, Q-leader, multi leader, multi leader style, add leader, aligned leader, remove leader, dimensions text angle, dimensions text alignment and quick dimensions.

Practical Content:

Layer Application
Uses of layer and apply the concept on various drawing – layer on / off. freeze or thaw in all viewports and current viewport. lock and unlock application in Layer, apply colour line type and plot management on various drawings.

Application of Annotation Tools
Application of text, text setup style and setting, single line text, multiline text, inserting text, scale text, arc text, mirrtext, edit text, spell, table, table Style and table edit.

Template Application
Create templates and insert drawings.

Dimensions Application
Use dimensioning technique on drawings through different process - linear, aligned, radius, diameter, Angle, arc length, continuous, baseline, dimension space, dimensions Break, inspection, jogged radius, ordinate dimensions, leader, Q-leader, multi Leader, multi leader Style, add leader, aligned leader, remove leader, dimensions text Angle, dimensions text alignment, quick dimension.

Project Content:

Project-III (2D Drawings)

1.1 Put complete dimensions of lamina which already drawn in 2D format (10 hrs)
1.2 M24x3x125 LG hexagonal bolt, nut and washer with complete dimensions (08 hrs)
1.3 1st angle & 3rd angle Projection symbol (2 hrs.)
1.4 Draw a flange coupling with complete dimensions, where the dia of shaft is 40mm. (10 hrs.)
1.5 A one room building 7000x5000 consists of a front veranda 2000 wide. The following data are given – Plinth height 450, Thickness of main wall 250, Height of lintel 2100 from finished floor level, Celling height 3000. Door 1200x2100 and window 1000x1500 with complete dimensions (All dimensions are in mm) (12hrs.)
1.6 Draw Steel shapes – Beams (I-Shape), Angle (L-Shape), Channels (U-Shapes), Rectangular hollow and Circular hollow shapes with complete dimensions. (8 hrs.)

Module No. 3: Draw isometric projection and the application of isometric drawing (Plane and curvature block)

Theory Content:

Isometric
Theory of isometric axes and plane isometric drawing, isometric grid, isometric dimensions. isometric text.

Practical Content:

Application of Isometric
Construct isometric view of mechanical block (Plane and Curvature), Isometric diagram, isometric piping drawing. Application of dimensions in isometric drawing including Isometric Text.

Project Content:

Project-IV (Isometric and Perspective)
1.1 Plane mechanical block with complete dimensions – 5 nos.
1.2 Curvature mechanical block with complete dimensions – 5 nos.

Module No. 4: Explain the importance of geometric dimensions with tolerance, fundamental of attribute along with frequently used symbols, application of enquiry tools, layout, plotting, publishing, data exchanging & embedding in AutoCAD.

Theory Content:

Geometric Dimension and Tolerance.
Definition and importance of geometrical dimensions and tolerance, geometric character and symbol, geometric tolerance components.

Block
Theory of create block, write block, edit block, inserting block and dynamic block.

Attribute
Theory of attributes - Define attribute, attribute edit, edit single and multiple attribute, attribute display, manage attribute, Attdia, Attext, Eattext

Parametric
Basic knowledge of geometric constraints, dimensional constraints, delete Constraints.

Enquiry
Theory of ID, dist., list, area and mass properties.

Layout, Plot and Publish
Theory of model space, paper space, viewport, plotting and scale plotting. Layout of page setup.

Object Linking, Data Exchange and Embedding
Data exchange in AutoCAD where data interchange through raster files. Object linking and embedding. BOM creation on drawing Sheet.

Practical Content:

Geometric Dimension and Tolerance
Practical application of geometrical symbols and tolerances on production drawing

Block
Practical application of create block, write block, edit block, inserting block and dynamic block.

Application of Attribute
Practical application of attributes - Define attribute, attribute edit, edit single and multiple attribute, attribute display, manage attribute, Attdia, Attext, Eattext

Parametric
Application on drawing various constrain symbols and apply auto-constrain method.

Enquiry
Information of co-ordinate, distance, angle, area, volume, mass, moments of Inertia etc.

Layout, Plot and Publish
Practical application of paper space layout & page setup, working with view ports, view lock and unlock, View port layer management, plot style, plot in model, and layout Area. Publish and Publish to Web.

Object Linking, Data Exchange and Embedding
Practice Copy, copy base, copylink, pasteclipand Insert object, Apply data exchange through (Import & Export) DXFIN and DXFOUT. Application of raster images and edit raster images files, Ole links, Ole scale and hyperlink.

Project Content:
Project-V
Geometrical dimensions and tolerance applications on a Mechanical Job.

Project-VI
Attribute apply in drawing title block.

Module No. 5: Demonstrate the use of 2D objects and modify them using the 3D commands along with different editing tools used for the same.

Theory Content:

3D Foundations and Creating Solids
Why use 3D? Types of 3D models. Introduction to the 3D modeling Workspace, 3D ribbon panels. Basic 3D viewing Tools, preset 3D views and orbiting in 3D. using visual styles. 3D Navigation Tools view Cube steering wheel. Introduction to the user coordinate system (UCS) and dynamic UCS.UCS Basics, UCS icon. moving the UCS origin, moving the UCS to a Face, moving the UCS Using 3 Points, UCS X, Y, and Z commands. UCS multi-functional grips and saving a UCS.

Solid Editing
Theory under solid tabs and solid editing panels – Where and how to use slice, thicken, imprint, interface, extrude edge, offset edge, Fillet edge, chamfer edge, taper face, extrude face, offset face, shell, check, separate and clean.

Creating Solids & Surfaces from 2D Objects

Complex 3D geometry. extruded solids and surfaces Presspull. modifying extrusions. Swept solids, surfaces and also modifying sweeps 3D Paths. Revolved solids surfaces and modifying revolves. Lofted solids, surfaces and modifying Lofts. NURBS Surfaces. Creating NURBS Surfaces. Edit NURBS Surfaces.

Advanced Solid Editing.

Editing components of Solids. Editing faces, edges, extruding faces. offsetting faces and Moving faces, rotating faces. tapering faces. removing faces, copying faces. Fillets and chamfers on solids.

Additional Editing Tools

Practice Creating a Shell. Solid Imprinting Edges on an object. Interference Checking. Converting Objects to Surfaces and Solids.

Mesh modeling

Theory of 3D Basic Mesh form known as Mesh Primitive object such as Box, Cone, Cylinder, Pyramid, Sphere, Wedge, and Torus. How to Modify Faces, Edges and Vertices by Stretching, Pulling Edge and also Reshape, Creasing, Refining and Splitting Faces.

Manage Camera and Animating

Define one or more Cameras with the Camera Command Including Camera Location, Target, Direction and Lens Length.

Visual Styles Manager

Lighting Setting. Use of Material Library, Create Material Library – Add – Delete – Rename. Basic Concept of Rendering.

Practical Content:

3D Foundations and Creating Solids

Under Home show tab and Modelling show panels – (Primitive, Solid, Boolean) Practice 3D primitive - box, cylinder, sphere, polysolid, wedge, cone, pyramid, and torus.

Practice extrude, presspull, revolve, and sweep. practice union, subtract, intersect and brep. Practice 3D navigation tools on a drawing. Command: Pan and zoom. Clear the concept of viewcube. Practice working with solid primitives and composite solids. Modifying solid primitives and composite solids. Practice Using UCS under Home show tabs and Co-ordinate panels. Use X,Y and Z axis on job..

Solid Editing

Practice the model under solid tabs and solid editing panels – Where and how to use slice, thicken, imprint, interface, extrude edge, offset edge, Fillet edge, chamfer edge, taper face, extrude face, offset face, shell, check, separate and clean.

Creating Surfaces from 2D Objects

Creating surfaces using network, loft, sweep, planner, extrude, revolve, blend, patch, and offset. Extruding along a path. Creating a sweep solid. Sweeping along a 3D polyline. Sweeping along a helix. Creating revolved solids. A lofted solid. Basic Solid and Surface Editing. Create and Edit a NURBS Surface – Fillet, Trim, Untrim, Extend, Sculpt, Spline and Blend Curves.

Advanced Solid Editing

Practice on Editing components of Solids. Editing faces, edges, extruding faces. offsetting faces and Moving faces, rotating faces. tapering faces. removing faces, copying faces. Fillets and chamfers on

solids.

Additional Editing Tools
Practice Creating a Shell. Solid Imprinting Edges on a object. Interference Checking. Converting Objects to Surfaces and Solids.

Mesh modeling
Practice 3D Mesh Primitive with Specific figures. Modify Faces, Edges and Vertices by Stretching, Pulling Edge and also Reshape, Creasing, Refining and Splitting Faces.

Manage Camera and Animating
Create and place the **cameras** into the 3D Model and Managing the Views.

Visualization
Practice Creating Visual Styles. Working with Materials. Creating a Sun Study. Placing Lights in a Model. Apply Rendering on 3D Models

Project Content:

Project-VII (Project Regarding Solid Modeling.)
Practice working with solid primitives with specific figures.
3D Mechanical block plane and curvature -10 nos.

Project-VIII (Project Regarding 3D Surface Modeling.)
3D Mechanical Surface Modelling Block Plane and Curvature -12nos.

Project-IX (Project Regarding 3D Mesh Modeling.)
Computer Chair With Handle making 3D Mesh Modeling.

Project-X (Working 3D Models)

Convert 3D Block to 2D Drawing which already create (12hrs.)

Various Spring Drawing (4 hrs.)

Stop Valve Body Conversion of 3D to 2D Drawing (12 hrs.)

Covert Spur Gear From 3D to 2D Drawing (08 hrs.)

Assembly and Details Drawing of Knuckle Joint 3D to 2D Drawing (12 hrs.)

Assembly and Details Drawing of Screw Jack 3D to 2D Drawing (16 hrs.)

LearningOutcome–AssessmentCriteria

Module No.	Outcome	AssessmentCriteria
1	Perform computer application with a knowledge of hardware and software and create drawing in Auto CAD using commands and tools.	**After completionofthismodulestudentswillbeableto:** 1.1 State the basic features and applications of various input and output devices. 1.2 Explain the installation procedure of application software. 1.3 State the different functions of operating systems. 1.4 Identify the screen nomenclature and applications of AutoCAD in engineering field. 1.5 Setup drawing unit and limits, pan & zoom. 1.6 Explain different coordinate system and make use of function key, file system. 1.7 Develop 2D drawing creation in AutoCAD platform with help of some Important Commands. 1.8 Demonstrate the application of different modifying tools in respect of 2D drawing.
2	Demonstrate the use of layer property management, different tools and commands that helps add information to text along with dimensioning the drafting.	**After completionofthismodulestudentswillbeableto:** 2.1 Explain different functions of Layer Property Management 2.2 Identify the application of different tools that helps - add information to text, an image and a database. 2.3 Choose different templates for design and drawing work. 2.4 Identify and make use of different dimensioning technique in drawings.
3	Draw isometric projection and the application of isometric drawing (Plane and curvature block)	**After completionofthismodulestudentswillbeableto:** 3.1 Explain the isometric view of mechanical block (Plane and Curvature). 3.2 Draw different isometric diagram, isometric piping drawing. 3.3 Determine the application of dimensions in isometric drawing.

Module No.	Outcome	AssessmentCriteria
4	Explain the importance of geometric dimensions with tolerance, fundamental of attribute along with frequently used symbols, application of enquiry tools, layout, plotting, publishing, data exchanging & embedding in AutoCAD.	**After completionofthismodulestudentswillbeableto:** 4.1 Define the importance of geometrical dimensions and tolerance, geometric character and symbol, geometric tolerance components. 4.2 Develop a library of frequently used symbols or parts through block. 4.3 Demonstrate the fundamental theory of attributes. 4.4 Discuss geometric constraints, dimensional constraints, delete Constraints. 4.5 Classify various constraints symbols and their applications. 4.6 Identify enquiry tools and their applications. 4.7 Demonstrate the application of layout, plot and publish. 4.8 Utilize Object Linking, Data Exchange and Embedding in AutoCAD.
5	Demonstrate the use of 2D objects and modify them using the 3D commands along with different editing tools used for the same	**After completionofthismodulestudentswillbeableto:** 5.1 Classify 3D models. 5.2 Introduce the user co-ordinate system (UCS) and dynamic UCS. 5.3 Use 2D objects and modify them using the 3D commands 5.4 Identify different solid editing commands and their applications. 5.5 Construct the solids and surfaces from 2D objects. 5.6 Develop the knowledge of Building solid and surface editing. 5.7 Demonstrate different additional editing tools. 5.8 Construct the Knowledge of Building 3D Mesh Model Creation and Editing. 5.9 Utilize camera with the help of different commands. 5.10 Organize and make use ofVisual Styles Manager.

Trainees Equipment / Software / Tools & Furniture For A Batch Of 30 Trainees		
Sl. No.	**Name of the Items**	**Quantity**
1	Desktop computers of the latest configuration prevalent at the time of procurement or with the following minimum features : CPU: 64 Bit i3/i5,Speed: 3 GHz or higher, Cache memory: Minimum 3 MB or better. RAM: 8 GB DDR-IV or Higher. Hard Disk Drive: 1 TB or Higher, 7200 rpm(minimum) or Higher, Wi-Fi enabled. Network Card: Integrated Gigabit Ethernet (10/100/1000)-Wi-Fi, USB Mouse, USB Keyboard &Monitor(Min. 22 Inch),Standard Ports & Connectors. Licensed Windows Operating System, Antivirus/Total Security,2 GB Graphics Card.	30 Nos
2	Laptop 4th Gen Ci5 Processor,16 GB RAM,1 TB Hard Disk,Win10 Preloaded Licensed OS,2 GB Graphics Card, Standard Ports & connectors.	01 No
3	Wi-Fi Router/48 Port Switch with Wireless Connectivity option.	01 No
4	Lab should have structured cabling(to enable working with Wired Networks too Practical)	As Required
5	Internet or Intranet Connectivity	As Required
6	Network Monochrome Laser Printer A3 Size	01 No.
7	Optical Scanner(Flatbed A4)	01 No.
8	LCD Projector with Matte(Antiglare) Screen	01 No.
9	KVA Online UPS	
10	External Solid State Hard Disk 1 TB	02 Nos.
11	LAN Setup	As Required

SOFTWARE PER UNIT		
Sl. No.	Name of the Items	Quantity
1	MS Office 2010(Professional) or the latest version available at the time of procurement	31 Licenses
2	Antivirus for - clients / workstations in profile with validity of an year or more which should be renewed on expiry	31 Licenses
3	Autocad Software	31 Licenses

Marks Distribution

Outcome	Outcome Code	Total Th marks	Total Pr marks	Total OJT marks
Perform computer application with a knowledge of hardware and software and create drawing in Auto CAD using commands and tools.	CON/0809/OC1	20	120	0
Demonstrate the use of layer property management, different tools and commands that helps add information to text along with dimensioning the drafting.	CON/0809/OC2	40	130	0
Draw isometric projection and the application of isometric drawing (Plane and curvature block)	CON/0809/OC3	30	130	0
Explain the importance of geometric dimensions with tolerance, fundamental of attribute along with frequently used symbols, application of enquiry tools, layout, plotting, publishing, data exchanging & embedding in AutoCAD.	CON/0809/OC4	30	130	0
Demonstrate the use of 2D objects and modify them using the 3D commands along with different editing tools used for the same.	CON/0809/OC5	30	140	0
Work in real job situation with special emphasis on basic safety and hazards in this domain (OJT).	CON/0809/OC6	0	0	150
Employability Skills – 60 Hrs	DGT/VSQ/N0102	50	0	0