MASTER CERTIFICATE COURSE IN CAD CAM

Ministry of Micro, Small and Medium Enterprises, New Delhi
(MSME-Technology Centre)

COURSE NAME: Computer Aided Design (Auto CAD and Solid Works)

COURSE CODE:

COURSE OUTCOMES: The aim of this course student should be able to:

- Understand types of different CAD/CAM/CAE software.
- Create 2D geometric sketches by using Auto CAD/Collab CAD and Solid works a software.
- Develop 3D modeling by using advanced command.
- Clarify of Knowledge to the assembly constraint & develop different types of assembly design by using AutoCAD & Solid Work.
- Understand design generative & interactive drafting.

THEORY HOURS: PRACTICAL HOURS: 120 THEORY MARKS: PRACTICAL MARKS: 60

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	PR hours	Marks	
UNIT-I	INTRODUCTION OF CAD/CAM/CAE	At the end of this Unit the student should be able to: • Understand CAD/CAM/CAE software. • Understand various feature in CAD software. • Understand various types of CAD software. • Understand Uses and Importance of CAD software in Industries. • Understand selection criteria of CAD software.	Capability of CAD Software and Introduction to AutoCAD, Collab, Solid Work. Description of the feature that have been added or changed since new Release CAD. Criteria for selection of CAD workstations, Shingle Design Process, Design criteria, Geometric modeling, entities, 2D & 3D Primitives. Different Types of cad software. Also comparison of various CAD Software. CAD software features. Concept of hardware & software.	20	8	
UNIT-II	INTRODUCTION OF SKETCHER AND EDIT COMMAND	At the end of this Unit the student should be able to: • Understand drawing curve object. • Create various types of sketch geometry. • Understand editing property tools. • Understand controlling drawing	Drawing curve objects (Circle, Arc, Ellipse, elliptical arcs). Creating solid filled areas- Regions, Hatch, Dot-nut, DD type. Drawing line object like line, polyline, multiline etc. Drawing curve objects like Circle, Arc, Ellipse, elliptical arcs etc. Editing objects using the object property tool bar and various method & Controlling Drawing Display. (Carry, Lengthen,	25	12	

		display. • Understand geometric dimension & tolerance method	Stretching, Offset, Align, Trim, Extend, Array etc. Detailed discussion on Dimensions, Geometrical Dimension, Tolerance method in AUTOCAD.			
UNIT-III	PART DESIGN & SURFACE MODELING	At the end of this Unit the student should be able to: • Working with block & defining block attributes. • Understand Concept of Isometric Drawing, Layout & Plotting. • Execute of solid modeling / 3d modelling. • Create surface modeling.	Working with block & defining block attributes. Concept of Isometric Drawing, Layout & Plotting. Creating of solid modeling / 3d modelling. Like creating, Editing, and modification technique. Creating of surface modeling like creating, Editing, and modification technique.	25	14	
UNIT-IV	PART MODELING & ASSEMBLY	At the end of this Unit the student should be able to: • Understand Capability of Solid work Software. • Understand Basic Part Modeling, Basic Modeling, Terminology, Choosing the Best Profile, Choosing the Sketch Plane, Details of the Part feature. • Understand concept of assembly constraint. • Clarify Different type of assembly.	Introduction & Capabilities of Solid Work. SolidWorks Basics and the User Interface What is the SolidWorks Software Design Intent File References Opening Files The SolidWorks User Interface. Basic Part Modeling, Basic Modeling, Terminology, Choosing the Best Profile, Choosing the Sketch Plane, Details of the Part Boss Feature, Patterning, revolving, shelling, ribs & editing features. Assembly- Bottom-Up Assembly, Creating a New Assembly.	25	12	
UNIT-V	DRAFTING	At the end of this Unit the student should be able to: • Understand Bill of Materials. • Create Assembly Drawings. • Create & draw various drafting views. • Understand dimensions, annotations & various Engineering symbols.	Bill of Materials, Assembly Drawings, Drafting generate standard three views, model view, and predefined view, standard section views, crafting drawings, creating dimensions, annotations, notes and surface finish symbols, add geometric tolerance to the drawing views, add center marks and center lines to the drawing views, add center marks and center lines to the drawing views	25	14	

COURSE NAME: Advanced-CAD (CREO PARAMETRIC & CATIA)

COURSE CODE:

COURSE OUTCOMES: The aim of this course student should be able to:

- Understand advance Computer aided design software (CREO PARAMETRIC & CATIA) as compare to other CAD software.
- Create 2D geometric sketches by using CREO PARAMETRIC software.
- Develop 3D solid & surface modeling by using advanced command.
- Design and develop the mechanical component and product.
- Develop complex CAD geometry using high class surfacing
- Understand assembly constraint & develop different types of assembly design.
- Understand design generative & interactive drafting.
- Use of CATIA and CREO in sheet metal and Tooling industries
- Apply knowledge in create complicated modeling & creative/innovative solution.

THEORY HOURS: PRACTICAL HOURS: 160 THEORY MARKS: PRACTICAL MARKS: 60

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	PR hours	Marks	
UNIT-I	INTRODUCTION TO ADVANCE CAD & TOOLS	At the end of this Unit the student should be able to: • Understand advance computer aided design. • Understand Different types CAD software. • Understand advanced features added & changed since new release software. • Understand difference between various software as compare to CREO PARAMETRIC & CATIA. • Execute the concept of hardware & software.	Capability of CAD Software and Introduction to CREO PARAMETRIC & CATIA. Description of the feature that have been added or changed since new Release software. Criteria for selection of CAD workstations, Design Process, Design criteria, Geometric modeling, entities, 2D & 3D Primitives. Different Types of cad software. Also comparison of various CAD Software. CAD software features. Concept of hardware & software.	20	8	
UNIT-II	ADVANCE PARAMETRIC	At the end of this Unit the student should be able to:	Sketching in CREO PARAMETRIC & CATIA, Creating and constraining various sketch profile, Operations on	40	12	

	SKETCHER	• Have knowledge in sketching interface. • Understand various sketch profile tool. • Have Knowledge various modification tools. • Create complicated geometry sketch • Understand & Use Project 3D Elements, Intersect 3D Elements, Isolate sketch profile	sketch Geometry viz. corner, quick trim, break, chamfer. Project 3D Elements, Intersect 3D Elements, Isolate sketch profile. Various sketch based projects.			
UNIT-III	ADVANCE PART DESIGN AND COMPLEX SURFACE MODELING	At the end of this Unit the student should be able to: • Understand 3D Modeling concept. • Use various workbench based feature. • Illustrate advanced Transformation features. • Use and create Surface Based Features. • Execute various surface creation methods. • Perform advanced solid & surface modeling	Various workbench based features viz. pad, pocket, shaft, Groove, Hole extrude, revolve sweep, loft etc. Transformation Features Translate, Rotate, Mirror, R/C pattern, Scale etc. Surface Based Features split, close surface, sew surface. Various advance tasks power copy, catalogs, design table etc. Various surface creation methods method extrude, revolve, offset, swept, loft. Operation on shape geometry join, healing, trim, extract geometry projects. Advanced commands e.g. bend solid, toroid bend etc.	60	14	
UNIT-IV	ASSEMBLY MODELING & DRAFTING	At the end of this Unit the student should be able to: • Understand concept of assembly constraint. • Understand difference between bottom up and Top down assembly. • To develop Assembly model. • Understand concept of Drafting. • Understand different types of view. • Use different engineering symbols • Create Bill of material.	Various Assembly constraints. Working with bottom up and top down assembly. Design in context. Generating bill of material. Design and development of mechanical component and design product in CREO and CATIA CAD software Creating various views through wizard. Creating various section views. Add a B.O.M. Adding text and labels. Dimensioning, Various engineering symbols, Translators.	40	12	

COURSE NAME: CAD/CAM (UNIGRAPHICS CAD & UNIGRAPHICS CAM)

COURSE CODE:

COURSE OUTCOMES: The aim of this course student should be able to:

- Understand advance Computer aided design software (UNIGRAPHICS CAD & UNIGRAPHICS CAM) as compare to other CAD software.
- Create 2D geometric sketches by using UNIGRAPHICS CAD & UNIGRAPHICS CAM software.
- Develop 3D solid & surface modeling by using advanced command.
- Understand assembly constraint & develop different types of assembly design.
- Understand design generative & interactive drafting.
- Apply knowledge in create complicated modeling & creative/innovative solution.
- Understand Post processing.
- Execute & generate various Milling, Lathe, EDM operations.
- Generate CNC program

THEORY HOURS: PRACTICAL HOURS: 120 THEORY MARKS: PRACTICAL MARKS: 60

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	PR hours	Marks	
UNIT-I	INTRODUCTION TO UNIGRAPHICS CAD & UNIGRAPHICS CAM	At the end of this Unit the student should be able to: • Understand advance computer aided design. • Understand Different types CAD software. • Understand advanced features added & changed since new release software. • Analyze difference between various software as compare to UNIGRAPHICS CAD & UNIGRAPHICS CAM. • Execute the concept of hardware & software.	Capability of CAD Software and Introduction to UNIGRAPHICS CAD & UNIGRAPHICS CAM. Description of the feature that have been added or changed since new Release software. Criteria for selection of CAD workstations, Shingle Design Process, Design criteria, Geometric modeling, entities, 2D & 3D Primitives. Different Types of cad software. Also comparison of various CAD Software. CAD software features. Concept of hardware & software.	20	02	

UNIT-II	UNIGRAPHICS SKETCHER & SOLID MODELING	At the end of this Unit the student should be able to: • Have fundamental knowledge of UG-CAD software. • Create complicated geometry sketch • Understand Adding Geometric & Dimensional Constraint to sketches. • Perform Drawing sketches for solid models. • Understand various sketching tools. • Understand & Create sketches in the Sketch task environment & Modeling Environment.	Introduction of Unigraphics-CAD. History of cad & UG. Technical terms related to UG-CAD. Drawing sketches for solid models. Creating sketches in the Sketch task environment & Modeling Environment. Understand Various Sketching Tool. Editing, Extruding, Revolving sketches. Adding Geometric & Dimensional Constraint to sketches.	15	8	
UNIT-III	ADVANCE SOLID MODELING	At the end of this Unit the student should be able to: • Understand Working with Datum plane, Coordinate System, and datum axes. • Understand Advance Modelling Tool. • Apply advance editing, modifying, creating feature. • To execute Boolean, extrusion termination operations. • Create 3D model design.	Working with Datum plane, Coordinate System, and datum axes. Specifying Boolean operation, Specification other Extrusion Termination option. Advance Modelling Tool like creating various types of Hole, Grooves, Slots, Dove-Tail Slots, Chamfer, and Edge Blend. Pattern Feature Tool, Mirror Feature Tool, and Sweeping Sketches along guide curve. Creating swept, Tubes or cables, Threads, Shell Features.	25	12	
UNIT-IV	ASSEMBLY DESIGN & SURFACE MODELING & DRAFTING	At the end of this Unit the student should be able to: • Understand surface modeling concept. • Create surface model. • Understand concept of assembly	Various Assembly constraints. Working with bottom up and top down assembly. Design in context. Generating bill of material. Tool Develop & design in UG-CAD. Surface Modelling Feature, surface analysis, curve analysis, Family table. Generating, Editing, and	20	14	

		constraint. • Understand concept of Drafting. • Understand different types of view. • Use different engineering symbols	Dimensioning the Drawing views. Types of Drawing View, Modifying the properties of Generated drawing view, printing tools, print, plot.			
UNIT-V	TOOL PATH GENERATION	At the end of this Unit the student should be able to: • Understand capabilities of UG CAM. • Understand CAM concept, Master Model concept. • Understand Manufacturing application.	Introduction to Unigraphics CAM environment. Review of Modelling. Introduction to CAM concept, Master model concept. Machining environment, Operation Navigator. Re-entering into the Manufacturing application. Manufacturing Tools, Creating new operation. Manufacturing applications, Saving part file, closing part file.	20	12	
UNIT-VI	CAM PROGRAM GENERATION	At the end of this Unit the student should be able to: • Understand Various Milling and Lathe operations by using Unigraphics CAM. • Execute various drilling, reaming operation & hole making etc. • Understand various boundary setting. • Execute all milling & lathe operation by using UG CAM. • Understand Wire EDM, EDM operation. • Understand generate Wire EDM Operation.	Various Milling and Lathe operations by using Unigraphics CAM. Point to point machining. Creating drilling & reaming operation and hole making. Planner mill overview Profiling, Single level, Multi-level. Multi region, Creation of Boundaries. Setting Custom Boundary Member Data Setting Drive Cutting Method, Ramping method. Cut types, Trim boundary, and Uncut Region boundary. Creating Cavity Milling operation. Blank Geometry and offset, Uses of cutting option. Creating fixed contour operation. Lathe cross section, common turning parameters. Rough & Finish turning, What is wire EDM, EDM dialog overview? Wire EDM operation, creating Wire EDM Operation. Internal & External Trim operation	20	14	

COURSE NAME: COMPUTER AIDED ENGINEERING (ANSYS)

COURSE CODE: ANSYS WORKBENCH MECHANICAL

COURSE OUTCOMES:

After completion of course Student should be able to

- Able to Analyze and Understand Customers Need
- Able to Discuss and Finalize analysis approach
- Perform preprocess Geometry cleanup for imported CAD Data
- Perform Process, apply boundary condition
- Post Process, view and plot the result
- Analyze Using CAE Software
- Interpret Of Output & optimize the design

THEORY HOURS: PRACTICAL HOURS: 80 THEORY MARKS: PRACTICAL MARKS: 60

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	PR Hrs.	Marks	
UNIT-I		At the end of this unit student should be able to • Understand Finite element method. • Work with ANSYS Graphical user interface • Describe stress strain relationship • solve static Analysis	Introduction to Finite Element Method of solving field problems using ANSYS workbench. User Interface of ANSYS Workbench Mechanical, Boundary conditions. Strain-Displacement relations. Stress-strain relations. One Dimensional Problem: Finite element modeling. Local, natural and global coordinates and shape functions. Quadratic shape functions, application of static Analysis with ANSYS Workbench Mechanical.	10	04	
UNIT-II		At the end of this unit student should be able to • Understand the axial stress on trusses and frame • To apply proper remote boundary conditions • Knowledge of post processing • Evaluate the results of solution	Analysis of trusses and frames: Analysis of plane truss with number of unknowns not exceeding two at each node. Analysis of frames with two translations and a rotational degree of freedom at each node. Analysis of Beams: Element stiffness matrix for two nodded, two degrees of freedom per node for beam element. Solving the using ANSYS Workbench Mechanical & details of result reading in post processing.	20	14	
UNIT-III		At the end of this unit student should be able to • To use of finite element modeling with ANSYS	Finite element modeling of two dimensional stress analysis problems with constant strain triangles and treatment of boundary conditions. Finite element	12	10	

		Workbench Mechanical • Apply boundary conditions in ANSYS Workbench Mechanical • Results reading • Optimization of analysis	modeling of Axisymmetric solids subjected of axisymmetric loading with triangular elements. Convergence requirements and geometric isotropy To Subjected To Design Optimization And Parametric Of Post processing Result Of ANSYS Workbench Mechanical			
UNIT-IV		At the end of this unit student should be able to • To have Fundamental knowledge of NON-LINER • To understand thermal behavior • To describe conduction, convection & radiation. • To use 1D & 2D element of thermal	Steady state heat transfer analysis: One dimensional analysis of a fin and two dimensional conduction analysis of thin plate. Using the NON-LINER solver to solve the Complex problem in ANSYS Workbench Mechanical Dynamic analysis: Formulation of finite element modeling of Eigen value problem for a stepped bar and beam. Evaluation of Eigen values and Eigen vectors.	14	12	
UNIT-V		At the end of this unit student should be able to • To knowledge basic of 3D element • To understand the factor of safety concept • To predict the behavior of analysis • To use ANSYS Workbench Mechanical simulation tools	Finite element formulation of three dimensional problems in stress analysis. And design Optimization over the safety factor to predict the failure of design and stress value in ANSYS Workbench Mechanical	12	10	
UNIT-VI		At the end of this unit student should be able to • Understand the dynamics of Analysis • Describe the steady state conditions over the analysis • To have validation of analysis • To execute the knowledge in tooling.	Finite Element formulation of Dynamic transient analysis result validation and supporting data file to simulate the real world problems into ANSYS Workbench Mechanical & Application of computer aided engineering in tool and die engineering.	12	10	

COURSE NAME: CNC PROGRAMMING AND CNC MACHINING

COURSE CODE:

COURSE OUTCOMES: After completion of course Student should be able to:

- Explain applications and advantages of CNC machines and technology
- Prepare CNC program for CNC Lathe , Milling, EDM and WEDM
- Calculate CNC Machining Parameters
- Prepare process plan, job card, inspection report
- Handle measuring instrument for inspection
- Prepare program and execute machining for CNC Lathe , Milling, EDM and WEDM
- Follow Safety norms during operations

THEORY HOURS: 40 PRACTICAL HOURS: 120 THEORY MARKS: 60 PRACTICAL MARKS: 60

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH hours	Marks	
UNIT-I	Introduction to CNC technology and CNC programing	After completion of unit Student should be able to: • Explain applications and advantages of CNC machines and technology • Understand and explain difference between conventional & non-conventional machine tool • Demonstrate and explain various CNC control • Calculate technological data for CNC machining • Explain the JH system, its use and application	Introduction to CNC technology – CNC machines & controls. History & development of CNC technology. Conventional Vs. non-conventional machine tool. Numerical control on CNC machine tools CNC control and CNC Control and types of CNC control Calculation of technological data for CNC machining. CNC clamping system. Implementation of JH for CNC, Basic health and safety, CNC programming basics. Introduction to manual NC programming, Manual NC programming for lathe & milling machines. Application Numerical Control, Advantages, & Disadvantages, Adoptive Control System. Practical training & workshop for above sub topics on CNC Machine.	10	8	
UNIT-II	CNC Programing	After completion of unit Student should be able to • Understand and explain the concept and importance of CNC	Introduction to CNC programming Introduction and demonstration of line programs CNC programming for lathe & milling machine using iso codes into the CNC simulator.	20	10	

		programming • Prepare and understand line program for various profiles • Identify and set parameters for various simulators • Prepare and simulate various operation cycles for lathe and milling • Use and simulate cycles using various Controls • Knowledge of the parameters for various machining cycles and operations	CNC programming for lathe and milling machines using different machining cycles into the CNC simulator. Procedures Associated with part programming, Cutting process parameter selection, Process planning issues and path planning, G & M Codes, Interpolations, Canned Cycles and Subprograms, Tool compensations Exposure for programming and simulator of FANUC, SINUMERIC, DMG TURNPLUS & Controls through post processors. Programming exercise. Machining of programmed exercise on CNC lathe & milling machines.			
UNIT-III	CNC Machining – Lathe	After completion of unit Student should be able to • Calculate parameters for turning operations • Understand the parameters of lathe operations • Explain operation sequence for the lathe operations • Prepare operation sequence for test run • Set , Simulate, and perform various operations like turning , grooving threading etc.	Plan and optimize programs for CNC turning operations. Calculate parameters like speed feed etc. and set a references for the various operations Prepare operation and operation sequence for the lathe operations like turning, grooving etc. Prepare & set CNC lathe operations and test run programmed Execute program and inspect simple geometrical forms / standard parts Use of various PPE's on CNC lathe machine	25	12	

UNIT-IV	CNC Machining – Milling	After completion of unit Student should be able to • Calculate parameters for milling operations • Understand the parameters of milling operations • Explain operation sequence for the milling operations • Prepare operation sequence for test run • Set , Simulate, and perform various operations like core milling , cavity milling , PCD drilling etc.	Plan and optimize programs for CNC Milling operations. Calculate parameters like speed feed , depth of cut etc. and set a references for the various operations Various methods of work process like edge finding block center etc. Prepare & set CNC Milling operations and test run programmed Execute program and inspect simple geometrical forms / standard parts Use of various PPE's on CNC milling machine	25	15	
UNIT-V	CNC Machining – EDM & WEDM	After completion of unit Student should be able to • Calculate parameters for EDM and WEDM operations • Understand the parameters related to surface finish of work parts • Explain operation sequence for the operations • Calculate and set various parameters of the EDM and WEDM machines • Explain and describe difference between EDM and WEDM	Plan and optimize programs for CNC Wire EDM operations. Calculate parameters affecting surface finish Calculate various machining parameters like Ip, voltage etc Prepare & set CNC Wire EDM operations and test run programmed Execute program and inspect simple geometrical forms / standard parts Plan and optimize programs for CNC EDM operations. Prepare & set CNC EDM operations and test run programmed Execute program and inspect simple geometrical forms / standard parts Use of various PPE's on CNC milling machines	20	12	
UNIT-VI	Modern CNC Systems	After completion of unit Student should be able to • Explain and use Indexable tools • Describe and use ATC and explain its applications • Describe advanced CNC systems and its applications • Explain the importance of	Indexable carbide tools, Modular Tooling & Tool Presetting, Machining Centers, Automatic tool changers Introduction to advanced CNC systems like HSM, RP,CIM Importance and application of advanced CNC systems Computer Aided Part Programming , Part Program Generation through Del CAM Post Processors Computations for part programming	20	11	

		Computer Aided Part Programming				