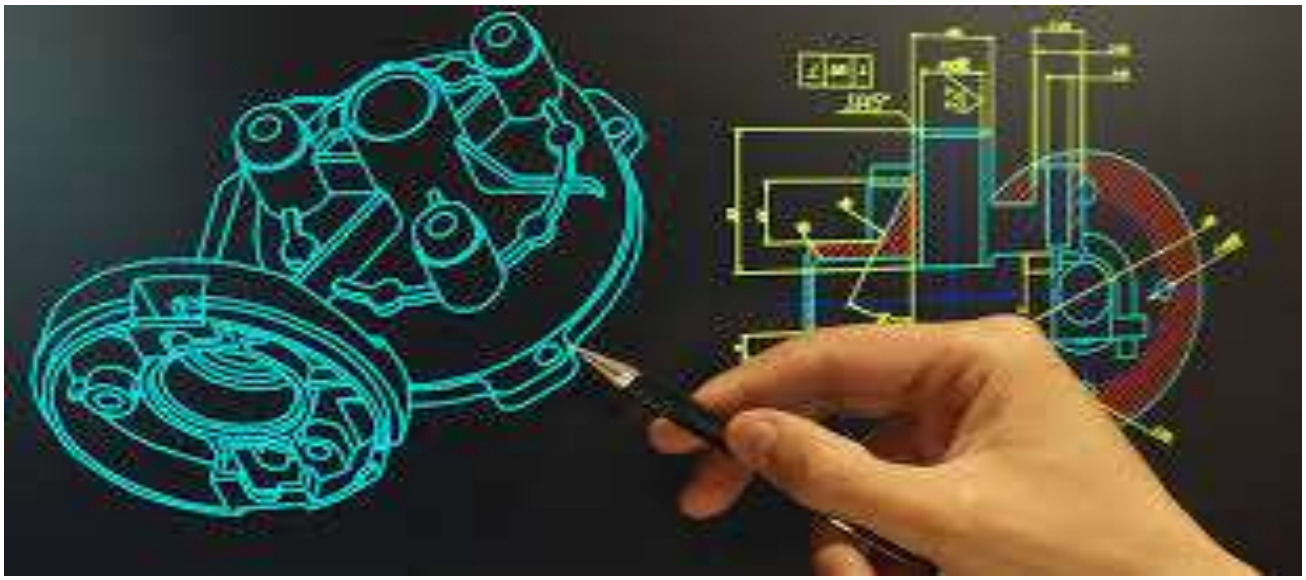
सूक्ष्म, लघु एवं मध्यम उद्यम मंत्रालय
DEVELOPMENT COMMISSIONER
MINISTRY OF MICRO, SMALL & MEDIUM ENTERPRISES
MSME TECHNOLOGY CENTRE

MODEL CURRICULUM



Qualification Name: Jr. Designer CAD/CAM

Qualification Code:

Version: 2.0

NSQF Level: 4.5

Model Curriculum Version: 2.0

Submitted By:

MSME TECHNOLOGY CENTRE

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COURSES / MODULE TEMPLATE

NOS /Module: Create & Modify Part Model using CAD Software

NOS /Module Code: MSME/MCCCC/01

Outcomes:

After completion of 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:30 Practical Hours: 60 Theory Marks: NA Practical Marks: 100

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	PR Hours	PR 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.	5	05
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 display. • Understand GD& T	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, Stretching, Offset, Align, Trim, Extend, Array etc. Detailed discussion on Dimensions, Geometrical Dimension, Tolerance method in AUTOCAD.	15	20

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.	15	25
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.	15	25
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	10	25

NOS /Module: Generate Part Program Using CAM Software (CAM)

NOS /Module Code: MSME/MCCCC/02

Outcomes:

- After completion of course Student should be able to
- Understand advance Computer aided design software (NX- CAD/CAM) as compare to other CAD software.
- Create 2D geometric sketches by using NX CAD 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 operations in CAM
- Generate CNC program with CAM Software

THEORY HOURS: - 30 PRACTICAL HOURS: 60 THEORY MARKS: - PRACTICAL MARKS: 100

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	PR hours	PR Marks
UNIT-I	INTRODUCTION TO NX-CAD &CAM / Master CAM	At the end of this Unit the student should be able to: • Understand Different types CAD and Advance CAD software • Understand the advanced features of NX software. • Analyze difference between various software as compare to UNIGRAPHICS CAD & UNIGRAPHICS CAM.	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.	10	10
UNIT-II	SKETCHER, & SOLID MODELING	At the end of this Unit the student should be able to: • Create complicated geometry sketch • Understand Adding Geometric & Dimensional Constraint to sketches. • Perform Drawing sketches for solid models. • Understand various sketching	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.	10	30

		tools. • Understand & Create sketches in the Sketch task environment & Modeling Environment.			
UNIT-III	TOOL PATH GENERATION	At the end of this Unit the student should be able to: • Understand capabilities of NX-CAM/ Master 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	30
UNIT-IV	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 NX- CAM/ Master CAm.	Various Milling and Lathe operations by using CAM software. 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.	20	30

NOS /Module: Analyze Part Model

NOS /Module Code: MSME/MCCCC/03

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: 30 PRACTICAL HOURS: 60 THEORY MARKS: NA PRACTICAL MARKS: 100

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	PR hours	PR Marks
UNIT-I	Understand Finite Element Methods & GUI of ANSYS	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. User Interface of ANSYS 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.	5	20
UNIT-II	Design & Analysis of 1D Structure	At the end of this unit student should be able to • Understand the axial stress on trusses and frame. • To apply proper 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 Mechanical& details of result reading IN POST PROCESING.	15	20
UNIT-III	Design & Analysis of 2D Structure	At the end of this unit student should be able to • To use of finite element modeling with ANSYS Mechanical • Apply boundary conditions in ANSYS	Finite element modeling of two dimensional stress analysis problems with constant strain triangles and treatment of boundary conditions. Finite element modeling of Axisymmetric solids subjected of axisymmetric loading with triangular elements. Convergence requirements and geometric isotropy To Subjected	15	20

		Mechanical • Results reading • Optimization of analysis	To Design Optimization And Parametric Of Post processing Result Of ANSYS Mechanical		
UNIT-IV	Design & Analysis of 3D Structure	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 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 Mechanical	15	20
UNIT-V	Design & Analysis of 1D,2D,3D Thermal Elements	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 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.	10	20

NOS /Module: Design Surfaces using Higher end CAD Software

NOS /Module Code: MSME/MCCCC/04

Outcomes:

After completion of 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: -30 PRACTICAL HOURS: 90 THEORY MARKS: - RACTICAL MARKS: 100

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	PR hours	PR 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.	15	10
UNIT-II	ADVANCE PARAMETRIC SKETCHER	At the end of this Unit the student should be able to: • Have knowledge in sketching interface. • Understand various sketch profile tool. • Have Knowledge various	Sketching in CREO PARAMETRIC & CATIA, Creating and constraining various sketch profile, Operations on sketch Geometry viz. corner, quick trim, break, chamfer. Project 3D Elements, Intersect 3D Elements, Isolate sketch profile. Various sketch	25	30

		modification tools. • Create complicated geometry sketch • Understand & Use Project 3D Elements, Intersect 3D Elements, Isolate sketch profile	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 extrudes, revolve, offset, swept, loft. Operation on shape geometry join, healing, trim, extract geometry projects. Advanced commands e.g. bend solid, toroid bend etc.	25	30
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.	25	30

NOS /Module: Generate CNC Program

NOS /Module Code: MSME/MCCCC/05

Outcomes:

After completion of course Student should be able to:

- Explain applications and advantages of CNC machines and technology
- Prepare CNC program for CNC Machine
- Calculate CNC Machining Parameters
- Prepare program and execute the program for CNC machining
- Follow Safety norms during operations

Theory Hours: 30 **Practical Hours: 60** **Theory Marks: NA** **Practical Marks: 100**

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH hours	PR hours	TH Marks	PR 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	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, health and safety practices during working, CNC programming basics. Introduction to manual NC programming, Application of Numerical Control, Advantages, & Disadvantages, Adoptive Control System.	15	5	-	10
UNIT-II	CNC Programing	After completion of unit Student should be able to • Understand and explain the concept and importance of CNC 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	Introduction to CNC programming Introduction and demonstration of line programs CNC programming for Lathe/ Milling machine using ISO codes into the CNC simulator. CNC programming for lathe/ Milling machines using different machining cycles into the CNC simulator.	15	15	-	50

		milling • Use and simulate cycles using various Controls • Acquire knowledge of the parameters for various machining cycles	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 Various Controls through post processors, Programming exercise.				
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	-	20	-	25
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	-	20	-	20

COURSES / MODULE TEMPLATE

NOS /Module: Employability Skills

NOS /Module Code: MSME/ES/02

THEORY HOURS: 60 PRACTICAL HOURS: - THEORY MARKS: 100 PRACTICAL MARKS: -

Refer Standard Curriculum developed by NCVET. (60-hours-MC-Employability-Skills_v4-DGT (1).pdf)