



MODEL CURRICULUM

Qualification Name:

SENIOR TOOL DESIGN- CAD/CAM

Qualification Code: QG-6.5IT-04169-2025-V1-MSMETC

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Model Curriculum Version:

Submitted By:

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COURSES / MODULE TEMPLATE

SEMESTER: I

NOS /Module: Product Manufacturing with CNC Programming and Machining

NOS /Module Code: MSME/PGDTD/01

Outcomes:

After completion of course Student should be able to

1. Explain applications and advantages of CNC machines and technology.
2. Demonstrate and explain various CNC control
3. Calculate technological data for CNC machining.
4. Explain the JH system, its use and application Understand the importance and use of PPE's
5. Prepare and understand line program for various profiles Identify and set parameters for various simulators.
6. Prepare programs, demonstrate, simulate and operate CNC lathe machines for various machining operations
7. Prepare programs, demonstrate, simulate and operate CNC milling machines for various machining operations
8. Prepare programs, demonstrate, simulate and operate CNC EDM & WEDM machines for various machining operations
9. Define and explain Modern CNC systems and explain its importance in manufacturing.

THEORY HOURS: -

PRACTICAL HOURS: - 90

THEORY MARKS:

PRACTICAL MARKS: -100

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH hours	PR hours
Unit I	Introduction to CNC technology and CNC programing	After completion of unit Student should be able to: <ul style="list-style-type: none"> • 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.		10

		<ul style="list-style-type: none"> Understand the importance and use of PPE's 	<p>Manual NC programming for lathe & milling machines.</p> <p>Application Numerical Control, Advantages, & Disadvantages, Adoptive Control System.</p> <p>Practical training & workshop for above sub topics on CNC Machine.</p>		
Unit II	CNC Programing	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> Understand and explain The concept and importance of CNC programming. <ul style="list-style-type: none"> 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. Annalise parameters for various machining cycles and operations. 	<p>Introduction to CNC programming</p> <p>Introduction and demonstration of line programs CNC programming for lathe & milling machine using iso codes into the CNC simulator.</p> <p>CNC programming for lathe and milling machines using different machining cycles into the CNC simulator.</p> <p>Procedures Associated with part programming, Cutting process parameter selection, Process planning issues and path planning, G & M Codes, Interpolations, Canned Cycles and Subprograms,</p> <p>Tool compensations</p> <p>Exposure for programming and simulator of FANUC, SINUMERIC, DMG TURNPLUS & Controls through post processors.</p> <p>Programming exercise.</p> <p>Machining of programmed exercise on CNC lathe & milling machines.</p>		10

Unit III	CNC Machining - Lathe	After completion of unit Student should be able to <ul style="list-style-type: none"> • Optimize parameters for turning operations. • Analyze the parameters of the 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. • Execute CNC Lathe Machining by creating CNC Program 	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. Manufacturing a product by CNC Machining		20
UNIT-IV	CNC Machining -Milling	After completion of unit Student should be able to <ul style="list-style-type: none"> • Optimize parameters for milling operations • Analyze 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. • Execute CNC Milling Machining by creating CNC Program 	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

UNI T-V	CNC Machining -EDM & WEDM	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Optimize parameters for EDM and WEDM operations • Analyze 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 • Execute CNC WEDM / EDM Machining by creating CNC Program 	<p>Plan and optimize programs for CNC Wire EDM operations. Calculate parameters affecting surface finish Calculate various machining parameters like IP, voltage to 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.</p>		20
UNI T-VI	Modern CNC Systems	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Explain and use Index able tools • Describe and use ATC and explain its applications • Describe advanced CNC systems and it applications • Explain the importance of Computer Aided Part Programming • Interface Computer Systems for Manufacturing. 	<p>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 Creoparametric / DelCAM Post Processors Computations for part programming.</p>		10

COURSES / MODULE TEMPLATE

NOS /Module: Engineering Drafting and Modelling Using CAD Software

NOS /Module Code: MSME/PGDTD/02

Outcomes:

After completion of course Student should be able to

1. Understand and explain the Concept of Engineering Drafting and Modelling using CAD Software
2. Understand types of different CAD/CAM/CAE software.
3. Create 2D geometric sketches by using general drafting and design application (Auto CAD) and Multifaceted CAD Software Modeling Software (Solid works).
4. Develop 3D modeling by using advanced command available in the general drafting and design application (Auto CAD) and Multifaceted CAD Software Modeling Software (Solid works).
5. Understand assembly constraint & develop different types of assembly design by using Multifaceted CAD Software Modeling Software (Solid works).
6. Understand design with generative & interactive drafting concept and its application

THEORY HOURS: PRACTICAL HOURS: - 120 THEORY MARKS: - PRACTICAL MARKS: -100

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH hours	PR hours
UNIT- I		At the end of this Unit the student should be able to: <ul style="list-style-type: none"> • Understand the Concept of Engineering Drafting and Modelling using CAD Software • Understand CAD / CAM / CAE software. • Understand various feature in general drafting and design application (Auto CAD) and Multifaceted CAD Software Modeling Software (Solid works) • Understand various types of CAD software. 	Concept of Drafting and Modelling using CAD Software Capability of CAD Software Introduction to general drafting and design application (Auto CAD) and Multifaceted CAD Software Modeling Software (Solid works) Description of the feature that have been added or Changed since new Release CAD. Criteria for selection of CAD Software, Design and Modelling 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.		6

		<ul style="list-style-type: none"> • Understand Uses and Importance of CAD software in Industries. • Understand selection criteria of CAD software. 			
Unit II		<p>After completion of this unit Student should be able to</p> <ul style="list-style-type: none"> • Understand drawing curve object. • Create various types of sketch geometry. • Understand editing property tools • Understand controlling drawing display. • Understand geometric dimension & tolerance method 	<p>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.</p>		30
Unit III		<p>After completion of this unit Student should be able to</p> <ul style="list-style-type: none"> • Working with block & defining block attributes. • Understand Concept of Isometric Drawing, Layout & Plotting. • Execute of solid modeling / 3dmodelling. • Create surface modeling 	<p>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.</p>		24

UNIT-IV		<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> • Understand Capability of Middle end CAD Modelling software - Solidworks • 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. • Understand Different type of assembly 	<p>Introduction & Capabilities of Middle end CAD Modelling software -Solidworks Basics and the User Interface 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</p>		30
UNIT-V		<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> • Understand Bill of Materials. • Create Assembly Drawings. • Create & draw various drafting views. • Understand dimensions, annotations & various Engineering symbols 	<p>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</p>		30

COURSES / MODULE TEMPLATE

NOS /Module: Advance Manufacturing Practices Using CAM Software

NOS /Module Code: MSME/PGDTD/03

Outcomes:

After completion of course Student should be able to:

1. Understand the concept of Advance Manufacturing Processes using conventional Machining and Non-Conventional Machining
2. Recognise the Manufacturing Processes using CNC Machines and their utilities
3. Understand and explain needs of CAM Software during for CNC Programming and Machining
4. Understand capabilities of CAM Software like Master CAM & UG CAM.
5. Create 2D geometric sketches by using Master CAM & UG CAM.
6. Develop 3d Models through Master CAM & UG CAM for CAM Toolpath Generation practices
7. Understand CNC Programming Concept
8. Generate 2D Toolpath for Roughing, Semi finishing and Finishing through Master CAM & UG CAM
9. Generate 3D Toolpath for Roughing, Semi finishing and Finishing through Master CAM & UG CAM
10. Execute Post processing
11. Verify and simulate Toolpath generated through Master CAM & UG CAM
12. Execute Manufacturing of Product by CNC Machining with the application of Master CAM & UG CAM

Theory Hours: -

Practical Hours: -60

Theory Marks: -

Practical Marks: -100

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH Hours	PR hours
UNIT-I	Introduction to CAM Software	At the end of this Unit the student should be able to: <ul style="list-style-type: none"> • Understand the concept of Manufacturing Processes using conventional Machining and Non-Conventional Machining • Recognise the Manufacturing Processes using CNC Machines and their utilities • Understand and explain needs of CAM Software during for CNC Programming and Machining 	Introduction to Basic Manufacturing Processes, Concept of Conventional Machining and Non-Conventional Machining, CNC Programming and Machining in Manufacturing – types, use and application Needs of CAM Software in CNC Machining, Capability of CAM Software, Introduction to Master CAM and Unigraphics CAM. Scope of CAM software in Market advantages of CAM,		4

		<ul style="list-style-type: none"> • Understand capabilities of CAM • Software like Master CAM & UGCAM. • Understand scope of software. • Understand difference between CAM/CAD/CAE software. • Analyze various CAM software compare to Master CAM & UGCAM. 	<p>Introducing CNC machining by using CAM,</p> <p>Distinguish between Various types of CAM software and Master CAM and Unigraphics CAM.CAD software features,</p> <p>Concept of necessary hardware & software.</p>		
UNIT-II	2D Modelling through MASTER CAM	<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> • Understanding 2D drawing. • Create basic geometry. • Execute editing, modification, • Creating features. • Understand brief Transformation feature. • Understand modify tool 	<p>Introduction to master CAM environment.</p> <p>To understanding 2D drawing. Creation of basic geometry like Point, line, rectangle, arc, ellipse, helix, spline & polygon. Modify Like fillet, chamfer, Trim, Break, Join, Extend, Dragging spline to arc, control point I NURBS Spline, Break Drafting etc.</p> <p>Transformation of object - Mirror, Rotate, and Translate, Scale. Selection Methods Creating Groups / Masking of entities / Assigning / Changing colors. Chain / Window / Area / Group / Delete / Undelete / Undo. Transformation of object - Mirror, Rotate, Translate, Scale</p>		4
Unit-III	3D Modelling through	<ul style="list-style-type: none"> • At the end of this Unit the student should be able to: • Understand Plane concept. 	<p>Plane concepts. Wireframe Modelling: 3D Wireframe, normal, entity, rotated, named, Number. Surface terminology. Modification of surfaces and</p>		4

	MasterCAM	<ul style="list-style-type: none"> • Understand Wireframe 3D Modeling. • Create surface modeling by use • Modification & editing surface feature. • Understand solid terminology • Create Drafting with all Engineering • symbols & dimensions 	<p>Editing of Surfaces features. Solid terminology - Creation of solids extrude, revolve, lofts, sweep, solids manager, fillet, Chamfer, solids editing, trim, Boolean operations, shell, draft etc. Creating drafting: dimensions/ drafting note/ freestanding witness / leader lines / attributes / Editing drafting text/ Creating hatch /Smart mode function to create a layout of different part views/ Layout view selection / dimensioning.</p>		
UNIT-IV	Toolpath Generation through MasterCAM	<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> • Understand 2D tool path generation. • Understand concept of CNC machining. • Perform & execute generate various milling, Lathe operations. wire cut Machining • Execute Post processing. • Understand NC program Transfer to machine. • Verify and simulate Toolpath generated through Master CAM • Execute Manufacturing of Product by CNC Machining with the application of Master CAM 	<p>2D Tool path generation. Concepts of Machining: CNC control basics, & coordinate systems, Selection of tool, tool parameters, Program Manager / Creation of 2D tool path: Contour / Facing / Pocket/ Drill/ Opt rough/ waterline. Compensations, Drilling parameters / 3D contour machining surface roughing methods. - Pocket / Parallel for 3D Surfaces and Solids. Various 3D machining surface finishing methods. 3D machining surface roughing methods. Various 3D machining surface finishing methods. Post Processing: Generating NC / NCI Files / Editing NC Files / Verification and Program generation</p>		18

			for actual machining / verification / post processing / Job machining on CNC Milling Machine DMU 50 T simulation - Backlot / Solid NC Verification of material cutting and simulation. DNC Data I.e. NC Program Transfer to machine		
UNIT-V	Introduction to Unigraphics NX CAD & CAM	At the end of this Unit the student should be able to: <ul style="list-style-type: none"> • Understand UG CAD and UG CAM concept and the software environment • Understand capabilities of UGCAM. • Understand CAM concept, Master Model concept. • Understand Manufacturing application. • Create Simple Models for CAM Toolpath Generation Practices 	Introduction to Unigraphics CAD and CAM environment. Review of Modelling, Introduction to CAM concept, Master model concept. Machining environment, Basic 2D Modelling with Sketcher, Basic 3D Modeling – application of Extrude, revolve, Sweep Commands, Concept Datum Plane and Datum Axis Orientation Operation Navigator, Entering and Re-entering into the Manufacturing application. Manufacturing Tools, Creating new operation. Manufacturing applications, Saving part file, closing part file		12
Unit VI	Toolpath Generation through Unigraphics NX	At the end of this Unit the student should be able to: <ul style="list-style-type: none"> • Understand Various Milling and Lathe operations by using Unigraphics CAM. • Execute various drilling operation & hole making etc. 	Various Milling and Lathe operations by using Unigraphics CAM. Point to point machining. Creating grooving operation. Creating drilling & reaming operation and hole making. Planner mill overview Profiling, Single		18

		<ul style="list-style-type: none"> • Understand various boundary setting. • Execute all milling & lathe operation by using UG CAM. • Understand Wire EDM, EDM operation. • Understand generate Wire EDM Operation. • Verify and simulate Toolpath generated through UG CAM • Execute Manufacturing of Product by CNC Machining with the application of UG CAM 	<p>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, Concept of Wire EDM, EDM Creating Wire EDM Operation. Internal & External Trim operation, Post processing and simulation</p>		
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COURSES / MODULE TEMPLATE

NOS /Module: Design of Work holding Devices and Gauges

NOS /Module Code: MSME/PGDTD/04

Outcomes:

After completion of course Student should be able to:

1. Understand and analyze customers need
2. discuss and finalize product needs
3. Decide suitable Jigs and work holding devices
4. Conceptualize Jigs, fixtures and Gauges Assembly Design necessary for given component
5. Conceive the tool design parameters
6. Design against standard and parameters
7. Test against specifications and standards
8. Interpret of output and confirming to specifications
9. Communicate with manufacturing line

10. Take remedial action if required

Theory Hours: - 30

Practical Hours: -60

Theory Marks: - 100

Practical Marks: -100

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH Hours	PR hours
UNIT -I	Introduction	<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> Understand and Explain the needs of tooling in relation different manufacturing processes Define Jigs, Fixtures and Gauges Describe and classify locating elements Explain locating principle and methods. Select locating devices Use standard parts. 	<p>Introduction to Basic tooling, Concept of requirements of Tools in context with different Manufacturing Processes, Introduction to Jigs and Fixtures as Work holding devices, Elements of jigs and work holding Devices, Locating Elements: Introduction, Jigs (Production Devices), Locating Principle, Locating methods and devices, Standard parts and their selection</p>	6	-
UNIT -II	Clamping Devices	<p>At the end of this unit student should be able to:</p> <ul style="list-style-type: none"> Describe and classify devices Explain working of Pneumatics and hydraulic actuation clamping Analyze clamping force Interpret tolerance in design Analyze error 	<p>Clamping Devices: Introduction, Classification, Use and applications, Pneumatics and hydraulic actuation clamping, Analysis of clamping force, Tolerance and error analysis</p>	6	4
UNIT -III	Jigs	<p>At the end of this unit student should be able to:</p> <ul style="list-style-type: none"> Understand deign of jigs Design procedure for different jigs. Execute the Design of Jig based on given component Select material in Jig design 	<p>Jigs and Design Concept: Introduction, Classification of Jigs, Drill bushes, Assembly Construction of Different types of Jigs, Material for jig elements, different Automatic drill jig, rack and pinion</p>	6	24

		<ul style="list-style-type: none"> Analyze economic justification of use of jigs and fixture. Use of CAD/CAM in Jigs and Fixture Design. Designing of Jigs for Given Component 	Indexing device, Air operated drilling jig component, Group jigs and fixtures, chip control, Economic Justification for jigs and fixtures, clearances and Selection of jigs.		
UNIT -IV	Fixtures	At the end of this unit student should be able to: <ul style="list-style-type: none"> Understand design of fixture Design procedure for different fixture Execute the Design of Jig based on given component Select material in fixture design Maintenance of Fixture Use of CAD/CAM in Fixture Design. Designing of Fixture for Given Component 	Design of fixtures: Introduction, Design principles of fixtures, Types of fixture, General principles of boring fixtures, classification of boring fixture, lathe fixture, broaching fixture, Milling fixture, Grinding fixture, Planning fixture, Shaping Fixture, Inspection Fixture, welding fixture, modular fixtures, air operated fixtures and assembly fixture	6	24
UNIT -V	Gauges	At the end of this unit student should be able to: <ul style="list-style-type: none"> Explain and Classify Gauges Understand deign of gauges Design procedure for different gauges 	Design of Gauges: Introduction, Types of gauges, Gauge design Practices, Design principles of gauges.	6	8

COURSES / MODULE TEMPLATE

NOS /Module: Stamping Die Design

NOS /Module Code: MSME/PGDTD/05

Outcomes:

After completion of course Student should be able to

1. Grasp fundamental concepts of Stamping and Presses for Stamping.
2. Able to Understand and Analyse customers need,
3. Able discuss and finalize product needs
4. Conceptualize and Design Press Tool Assembly necessary for given Sheet Metal component
5. Conceive the Stamping Tool design parameters
6. Design against standard and parameters
7. Test against specifications and standards
8. Interpret of output and confirming to specifications
9. Communicate with manufacturing line
10. Take remedial action if required

THEORY HOURS: 30

PRACTICAL HOURS: -90

THEORY MARKS: 100

PRACTICAL MARKS: -100

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH hours	PR hours
UNIT-I	Introduction to sheet metal and Presses Stamping Processes	<p>At the end of this unit student should be able to:</p> <ul style="list-style-type: none"> • Understand Sheet Metal Parts Manufacturing processes • Recognise the Stamping Process by Press tool • Understand, classify and compare Press machines. • Describe the characteristics of press machines. • Explain the principle of stretch forming machine. • Understand feeding and Unloading equipment. • Recognise principles of presses 	<p>Introduction to Sheet Metal parts manufacturing processes, Stamping Processes on Sheet Metal,</p> <p>Introduction to Press tool and Press Tool Operations – Cutting, Non-Cutting, Hybrid Operation</p> <p>Presses-Classification of Presses- Mechanical, Hydraulic, and pneumatic presses,</p> <p>Press Characteristics, Operation and Safety features, Devices in presses.</p> <p>Principles of stretch forming machines,</p> <p>Principles of feeding and unloading equipment,</p>	6	-

			Operation principles of presses		
UNIT-II	Press tool Assembly Construction and Design Calculations for shearing dies	At the end of this unit student should be able to: <ul style="list-style-type: none"> • Explain shearing theory • Understand and describe General construction of Press Tools • Perform mathematical calculations for Designing of Punch and Dies • Prepare Strip Layout • Calculate best economy for production. 	Shearing Theory General assembly Construction of Blanking / Piercing tools Introduction terminology shearing dies- types of dies – analysis process Cutting clearance – size and tolerances of die opening and punch – force, power, energy in shearing, Effect of Cutting Clearance shearing with inclined edges – Strip layouts, Economical stock – Utilization.	6	18
Unit III	Elements of Press Tools	At the end of this unit student should be able to: <ul style="list-style-type: none"> • Describe and select elements of press tool • Perform Design calculation for elements • Apply alignment system design for press tool • Designing of Press Tools for Given Component 	Shearing dies – Classification, die plates – split dies, Rules of development for split dies, inserts, Punches-types of punches, punch holders, punches – strippers – Calculation of springs / rubber ejector, shedders, stops – pilots – stock guides – alignment system design for press tools. – Discussion of Various computer software for Stamping Die Design for sheet metal Parts Manufacturing -Designing of Press Tools for Given Component	6	24
Unit - IV	Compound Progressive and Bending Dies	After completion of unit Student should be able to: <ul style="list-style-type: none"> • Explain compound and progressive dies • Design Compound and progressive tool • Design Bending tool • Understand spring back in bending tool 	Compound dies, progressive dies, stock feeding, devices – cam actuated die, horn dies (type, sub-press dies) – precision shearing dies, shaving dies, lamination dies – Bending dies, theory of bending development of blank, spring back, curling, flanging and press brake dies, bending on	6	24

		<ul style="list-style-type: none"> Designing of Press Tools for Given Component 	press brake. -Designing of Press Tools for Given Component		
UNIT-V	Forming Dies	At the end of this unit student should be able to : <ul style="list-style-type: none"> Explain drawing and forming dies Design forming and drawing tool Design Bending tool Understand spring back in bending tool Use CAD/CAM/CAE in tool design Identify and rectify defects in Press Tool Designing of Press Tools for Given Component 	Drawing and forming Dies: Theory of drawing, Blank Development, strain factor, Calculation of force, Drawing Operation and Construction of Drawing dies – Drawing of rectangular components (Blank Development, stages, Draw Beads) – Ironing (application of rubber and hydraulic system) – Defects in Deep Drawing – Modern Metal forming techniques - Designing of Press Tools for Given Component	6	24

COURSES / MODULE TEMPLATE

NOS /Module: Design of Tools with Advance CAD Software Module I

NOS /Module Code: MSME/PGDTD/06

Outcomes:

After completion of course Student should be able to:

1. Understand and Explain the Basic concept of Tool
2. Recognise the needs of Tool designing with the help of CAD Software
3. Understand advance Computer aided design software (UG & CATIA) as compare to other CAD software.
4. Create 2D geometric sketches by using UG &CATIA software.
5. Develop 3D solid & surface modeling by using advanced command.
6. Understand assembly constraint & develop different types of assembly design.
7. Understand design generative & interactive drafting.
8. Apply knowledge in create complicated modeling & creative/innovative solution.
9. Create Tool Parts Models, Assembly and Drafting with the help of Unigraphics and CATIA

Theory Hours: -

Practical Hours: -120

Theory Marks:

Practical Marks: -100

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH Hours	PR hours
UNIT- I	Introduction to Advance CAD Software	At the end of this Unit the student should be able to: <ul style="list-style-type: none"> • Understand and Explain the Basic concept of Tool • Recognise the needs of Tool designing with the help of CAD Software • Recognise the application of CAD Software for Designing of Tool • Understand advance computer aided design. • Understand advanced features 	<ul style="list-style-type: none"> • Introduction to Tool and Tool Design Concept with the help of CAD Software • Introduction to Unigraphics NX & CATIA Software. • Description of the feature that have been added or changed since new Release of software. • Criteria for selection of CAD for modelling, workstations, • Geometric modeling, entities, 2D & 3D • Primitives. Different Types of CAD software. • Also comparison of various CAD Software. CAD 		4

		<p>added & changed since new release software.</p> <ul style="list-style-type: none"> Analyze difference between various software as compare to UG & CATIA. Execute the concept of hardware & software. 	<ul style="list-style-type: none"> software features. Concept of hardware & software. 		
UNIT-II	Sketcher in Unigraphics NX CAD	<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> 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 UG-NX cad. Execute the concept of hardware & software. 	<ul style="list-style-type: none"> Introduction of Unigraphics. History of CAD & UG. Technical terms related to UG. 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. 		12
UNIT-III	3D Modelling – Unigraphics UG	<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> Have fundamental knowledge of UG software. Create complicated geometry sketch Understand Adding Geometric & Dimensional Constraint to sketches. 	<ul style="list-style-type: none"> 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 		30

		<ul style="list-style-type: none"> • Perform Drawing sketches for solid models. • Understand various sketching tools. • Understand & Create sketches in the Sketch task environment & • Modeling Environment. 	<ul style="list-style-type: none"> • Blend. Pattern Feature Tool, Mirror Feature Tool, and Sweeping Sketches along guide curve. Creating swept, Tubes or cables, Threads, Shell Features. 		
UNIT-IV	Surface and assembly Modelling and drafting – UG NX CAD	<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> • Understand surface modeling concept. • Create surface model. • Understand concept of assembly constraint. • Understand concept of Drafting. • Understand different types of view. • Use different engineering symbols • Execute Modelling , Assembling and Drafting methods to for Tool Designing activity with Unigraphics NX CAD 	<ul style="list-style-type: none"> • Various Assembly constraints. • Working with Bottom up and top down assembly design in Context. • Generating bill of material. • Tool Develop & design in UG. • Surface Modelling Feature, surface analysis, • Curve analysis, Family table. Generating, • Editing, and Dimensioning the Drawing views. • Types of Drawing View, Modifying the properties of Generated drawing view, printing Tools, print, plot. • Tool parts Assembly Modelling, Assembling and Drafting using CATIA 		24
UNIT-V	Sketcher and 3d Modelling - CATIA	<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> • Have fundamental knowledge of CATIA software. 	<ul style="list-style-type: none"> • Introduction to CATIA and Important Technical Terms & Definitions. 		20

		<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • Understand function of Tool bar, hot keys, Color Scheme etc. • Drawing Display Tools like Zoom In, Zoom Out, and Pan etc. • Drawing sketches in Sketcher work bench. • Using sketching tools like lines, Center Lines, Rectangle, Point, and Circle etc. Editing and • Modifying Tools. Constraining Sketches and Creating Base Features. Solid Modeling Feature • Tool bars like reference Element, Sketch Based Feature, Dress up Feature, Hole Feature, • Editing Features, Transforming Features, • Free style concept and application • Boolean operations. Wireframe and surface • Design feature. Wire frame geometry, surface creation methods Extrude, revolve, spheres, 		
UNIT-VI	Assembly and Drafting - CATIA	<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> • Understand assembly concept & different type of assembly. • Use editing & constraint assembly features. • Understand drafting automatic & manually drawing. 	<ul style="list-style-type: none"> • Assembly Modeling. Creating Bottom up • Assemblies & Top-down Assemblies. Editing • Assembly Features. Working with Drafting • Work bench. Types of Views, generating • automatically & manually Drawing 		30

		<ul style="list-style-type: none"> • Create Various Dimensions, Tolerances, Datum, Surface finish, Welding symbols etc. • Execute Modelling , Assembling and Drafting methods to for Tool Designing activity with CATIA Software 	<ul style="list-style-type: none"> • View. Adding Various Dimensions, Tolerances, • Datum, Surface finish, Welding symbols etc. • Tool parts Assembly Modelling, Assembling and Drafting using CATIA 		
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SEMESTER II

COURSES / MODULE TEMPLATE

NOS /Module: Mold Design for Plastic Parts

NOS /Module Code: MSME/PGDTD/07

Outcomes:

After completion of course Student should be able to:

1. Grasp fundamental concepts of Plastics, Plastic parts and Moulding Processes and machineries.
2. Able to Understand and Analyse customers need,
3. Able discuss and finalize product needs
4. Conceptualize and Design Mould Assembly for necessary for given Plastic component
5. Conceive the tool design parameters
6. Design against standard and parameters
7. Test against specifications and standards
8. Develop prototype / simulation
9. Interpret of output and confirming to specifications
10. Communicate with manufacturing line
11. Take remedial action if required

Theory Hours: -30

Practical Hours: -90

Theory Marks: -100

Practical Marks: -100

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH Hours	PR hours
UNIT-I	Introduction to Plastic and Concept of Injection Moulds Assembly to produce Plastics	At the end of this Unit the student should be able to: <ul style="list-style-type: none"> • Understand and describe different types Plastics and Plastic Parts Manufacturing Processes • Describe terminology in Injection moulds • Understand and explain General concept Mould Assembly • List elements of moulds 	Introduction to Plastic and Plastic Parts –Classification, Use and Application Plastic Parts Manufacturing Process – Moulding Operations, Moulding Machines for Plastic Parts Manufacturing, Injection Moulding Process, Injection moulding Machine Basic terminology in moulds, General Mould Construction- Mould cavities and Cores – Size Calculations, Bolsters, Ancillary items, Attachment of mould to platen, – Discussion of Various computer software for Stamping Die Design for sheet metal Parts Manufacturing	6	18

		<ul style="list-style-type: none"> Describe the functions of element / component of Mould Calculate and Design Core and cavity for Injection mould 			
UNIT-II	Element of Injection Moulds and Design	<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> Decide ejection System and Cooling System for Injection mold Select standard moulds system To select best option among various option available To explain significance of parting surface Study/Analyses problem faced in designing & manufacturing tool Design Injection Moulds for Given Component 	<p>Basic Terminology injection, ejector grid, ejector plate assembly, ejection techniques, ejection from fixed half, sprue pullers, feed system – runner, gates Parting surface –general, flat parting surface, non-flat parting surface, relief of parting surface, venting. Mould cooling – general, cooling insert-type mould plates, cooling insert-type mould plates, cooling other mould parts, water connections and seals Standard mold system – general considerations, standard two-parts mould systems, deviations from the standard mould, comparative terminology -Designing of Injection Moulds for Given Component</p>	6	36
UNIT-III	Injection Moulds for Undercut Parts	<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> To select split moulds To use standard parts for split moulds Understand side cores and cavities Design moulding with undercuts To identify and apply various 	<p>Splits – general, sliding splits, angled-lift splits, standard parts for the splits type mould. Side cores and cavities – general, design features, types of side core and side cavity, standard mould parts. Moulding internal undercuts – general, from pin, split cores, side cores, stripping internal undercuts, standard</p>	6	18

		<ul style="list-style-type: none"> • design features • Design Injection Moulds for Given Component 	mould parts -Designing of Injection Moulds for Given Component		
UNIT-IV	Injection Moulds for Threaded Parts and three Plate Mould concept	<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> • To understand mould for threaded components both internally and externally threaded. • To use standard unscrewing type mould systems • Understand and design malty-daylight moulds • Describe hot runner mould and insulated runner mould • To select different standard element for hot runner type mould 	Mould for thread components – general, moulds for internally threaded components, moulds for externally threaded components, Mould construction, standard unscrewing type mould systems. Multi-day light molds – general, underfeed molds, triple-daylight mould, standard parts for underfeed moulds. Runner less moulds – general, nozzle, hot runner unit mould, Insulated runner mould, Hot runner plate moulds, standard parts for the hot runner type mould.	6	

UNIT-V	Injection Mould Design	<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> • Understand customer requirement and component specification • To draw the conceptual drawing for appropriate mould. • Perform design calculation for tooling. • To select different standard element. • To draw final tool design. • Evaluate design against standard • Prepare bill of material 	<p>Procedure for designing an injection mould – general, primary positioning of inserts, ejector system, ejector grid, complete the top half the drawing, complete the plan view, complete the cross-section, complete drawing and checking mould drawings</p>	6	18
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COURSES / MODULE TEMPLATE

NOS / Module: Design of Metal Die Casting

NOS / Module Code: MSME/PGDTD/08

Outcomes:

After completion of course Student should be able to

1. Grasp fundamental concepts of metal Casting and machineries
2. Able to Understand and Analyse customers need,
3. Able discuss and finalize product needs
4. Conceptualize and Design Die Casting Die Assembly for given component

5. Conceive the tool design parameters
6. Design against standard and parameters
7. Test against specifications and standards
8. Interpret of output and confirming to specifications
9. Communicate with manufacturing line
10. Take remedial action if required

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

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH hours	PR hours
UNIT-I	Introduction to Metal Casting	At the end of this Unit the student should be able to: <ul style="list-style-type: none"> • Understand fundamental concepts of metal Casting Processes and machineries • Describe and classify Die Casting machines • Classify Dies along with general die details • Explain various theoretical and practical aspect of die casting • Understand various theories related to Die Casting • List control variables in Casting 	Metal Casting Processes Casting Die Casting Machines – types, classification, Operations. Die-Casting Dies – introduction, specific details of die construction, classification dies, general Details of die design. theoretical and practical aspect of die casting Techniques affecting the parts, practical analysis and control of casting variables	5	-

UNIT-II	Die Casting dies	<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> • To select parting line • To perform design calculations • Understand and design various parameters in Die casting Die • Compare Die casting with other production processes • Design Die Casting Die Assembly for given component 	<p>Design of Die casting Dies: selection of parting line and general design, forming after casting, wall thickness, fillets and radii, tolerances, cored holes and recesses, inserts, bosses and projections, ribs and fins, threads, engraving and lettering, electroplated parts, designing for economy of production, comparison of Die Casting with other production processes</p>	15	15
UNIT-III	Die Steels	<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> • Understand characteristics of die steels` • Select steels for Die Casting • Select different Die casting alloys • Understand finishing and machining of Die casting 	<p>Die Steels: required characteristics of die steels, quality control of die steel, selection of steels for Die Casting Dies, heat treatment of die steels. Die casting alloys: types of Die Casting alloys and their properties and selection, introduction to Finishing and machining of Die casting.</p>	5	10
UNIT-IV	Estimation and Costing	<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> •Inspect the Die casting •Estimate Cost of Die Casting •Understand safety in Die Casting •Maintain the Too 	<p>Inspection of Die Casting: first inspection, final inspection, functions of the inspection department Estimating the cost of Die Casting: Estimating the die cost, estimating the casting cost, part cost, maintenance and safety education</p>	5	5

COURSES / MODULE TEMPLATE

NOS /Module: Mechanical Measurement and Total Quality Management

NOS /Module Code: MSME/PGDTD/09

Outcomes:

After completion of course Student should be able to

1. Describe and explain various Metrology, Inspection and Quality Control
2. Explain and demonstrate measuring techniques through mechanical measuring instruments e.g., Vernier caliper, Vernier height gauge, Vernier depth gauge, micrometers, Slip gauges
3. Understand definition of TQM & concept of TQM.
4. Solve problems effectively using a step-by-step process, Different concerns in an organization.
5. Experience the team dynamics in solving problems
6. Understanding good leadership.
7. Understand need for ISO 9000 / 45000 Quality System Elements and documentation.
8. Understand concept Quality auditing- QS 9000 – ISO 45000

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

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH hours	PR hours
UNIT- I	Concept of Metrology, Mechanical Measurement	After completion of unit Student should be able to: Understand the concept of Metrology, Explain and demonstrate Measurement Techniques	Introduction to Metrology, Measurement of straightness, flatness, parallelism, roundness and cylindricity, non-contact profiling systems Use and application of Mechanical Measurement through Steel rule, callipers, Vernier calliper, Vernier height gauge, Vernier depth gauge, micrometres, Slip Gauges	10	
UNIT- II	Inspection Quality and Quality Control	After completion of unit Student should be able to: Understand concept of Quality, Inspection, Quality Control Cost of Quality Statistical Quality control need Various control charts and Quality characteristics Process capability	Concepts of quality: Inspection, definition of quality, quality control, cost of quality, value of quality - Statistical quality control (SQC): SQC needs, benefits and limitations - Theory of control charts - control chart for variable - X & R chart - Frequency distribution - Variables and attributes - quality characteristics - Control chart for attribution p, np, and c charts - process capability.	10	

UNIT-III	Quality Circle	<p>After completion of unit Student should be able to:</p> <p>Concept of Quality Circle</p> <p>Process of Quality Circle</p> <p>Quality Assurance</p> <p>Quality Policy</p> <p>Sampling plan for single double and Multiple Sampling</p>	<p>Quality circle: characteristics of quality circle and the process of operation of quality circle - Quality assurance: quality assurance manual - quality policy, procedure and objectives - Sampling inspection: acceptance sampling - fundamental concepts, O-C curve and its construction - AQL, LTPD, AOQL - sampling plans for single, doubles and multiple sampling plans</p>	10	
UNIT-IV	Quality Philosophy	<p>After completion of unit Student should be able to:</p> <p>Understand various Quality Philosophies by Quality Gurus</p> <p>Juran Trilogy</p> <p>Deming's 14 points</p> <p>DOE Design of Experiment</p> <p>Quality function</p>	<p>Quality philosophies by quality gurus: Juran Trilogy, Deming's 14 Points, P-D-C-A Wheel, Taguchi's philosophy - Design of experiment - Seven QC tool of quality and their applications - Philip Crosby's Zero defect - Quality function deployment.</p>	10	
UNIT-V	Total Quality Management and Introduction to ISO 9000 ,ISO 45000	<p>After completion of unit Student should be able to:</p> <p>Understand TQM</p> <p>TQM for TQC, 5S, Kaizen</p> <p>Six sigma tools</p> <p>Quality cost</p> <p>Various Quality Management Systems</p> <p>ISO 9000 & ISO 45000</p> <p>Benefits of ISO systems</p>	<p>TQM definition - implementation of TQM - tools for TQC & 5's TQM - Kaizen: seven types of waste - six sigma concept - six sigma tools - TQM and six sigmas - Life cycle approach to quality costs - Prevention, appraisal and failure costs - Introduction to ISO 9000 and ISO 45000 - various models of ISO 9000 and ISO 45000 - benefits of ISO standards</p>	10	
UNIT-VI	Leadership	<p>After completion of unit Student should be able to:</p> <p>Understanding good leadership behaviours</p> <p>Learning the difference between leadership and management.</p> <p>Understand insight into your patterns, beliefs and rules.</p> <p>Defining qualities and strengths.</p> <p>Making key decisions.</p> <p>Understand benefits of Team work & Continuous process improvement</p>	<p>Leadership definitions and concepts - styles of leadership - principle of leadership - role of the leader - quality council - quality statement - customer focus and orientation - customer satisfaction and benefits - customer's perception of quality - service quality and its dimensions - Reliability: definitions - bathtub curve - FMEA: failures and causes of failures - maintainability and availability - MTBF - benchmarking</p>	10	

COURSES / MODULE TEMPLATE

NOS /Module: Manufacturing Process Planning and Heat Treatment

NOS /Module Code: MSME/PGDTD/10

Outcomes:

After completion of course Student should be able to:

1. Describe, explain and Classify Engineering material and explain physical properties of materials.
2. Define relation of grain size and relation to mechanical properties Review and brief discussion on stress strain
3. Evaluate tensile strength percentage of elongation etc& Annalise Fatigue and Creep testing, testing for Residual stresses
4. Explain Selection and specification of carbon and alloy steels and also Describe types of modern Cutting Tool materials
5. Understand and describe Powder Metallurgy and its applications
6. Understand and explain concept of hardenability, define and explain Austempering, Martempering and Isothermal annealing.
7. Determine and analysis Tool failures due to improper quenching and loading
8. Define and identify various manufacturing processes, Discuss process capabilities
9. Understand and explain sheet metal working, its applications and limitations
10. Summaries and define man machine consideration and Explain man machine information exchange
11. Implement and describe JIT, KANBAN. Describe quality function development
12. Explain concept of Rapid Prototyping & Define and implement Modern approaches to product design
13. Explain and streamline creation of manufacturing data base and application of computer in production management.

Theory Hours: - 30

Practical Hours: -

Theory Marks: 100

Practical Marks: -

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH Hours	PR hours
UNIT- I	Classification of materials	At the end of this Unit the student should be able to: <ul style="list-style-type: none"> • Explain and describe Crystal Structure • Define relation of grainsize and relation to mechanical properties. • Review and brief discussion on stress strain 	Types and Crystal Structures. Imperfections. Strain hardening, Recrystallisation and Grain growth. Primary and secondary recrystallization and sub-grain structure. Mechanism of strengthening in metals. Grain size and its relation to mechanical properties	6	

		<ul style="list-style-type: none"> Evaluate tensile strength percentage of elongation tc. Annalise Fatigue and Creep testing, testing for Residual stresses 	Review and brief discussion on stress strain diagram of steel and the parameters for ductility toughness, strain hardening, and tensile strength percentage of elongation etc. and Creep testing, testing for Residual stresses.		
UNIT-II	Tool Materials	<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> Explain Selection and specification of carbon and alloy steels Describe types of modern Cutting Tool materials Define and explain Properties of plastics Describe Powder Metallurgy 	<p>Selection and specification of carbon and alloy steels for general engineering purpose, Specification of materials as per various standards (IS, BS, AISI, APS etc.) Case hardening steels, Cold work tool steels, hot work tool steels, high speed tool steels. Types of modern Cutting Tool materials</p> <p>Introduction to Plastics. Properties of Plastics- Properties and applications of Carbon and alloy Steels, Specification of Grey iron casting IS: 210 SG Cast Iron IS: 865, Malleable iron castings IS: 2108 and IS: 2640. Selection and specification of die casting non-ferrous zinc and Aluminum (IS and LM Series). Powder Metallurgy and New Materials</p>	6	
UNIT-III	Heat treatment	<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> Understand and explain concept of hardenability Define and explain Austempering, Martempering and Isothermal annealing Determine and analysis Tool failures due to improper quenching and loading 	Hardenability, its concepts and its role in steel Specification. Hardening and annealing of tool Steels. Case hardening and local hardening, methods, selection and specification of such steels Study of Isothermal Transformation diagrams. Austempering, Martempering and Isothermal	6	

		<ul style="list-style-type: none"> • Understand and explain Heat treatment of non-ferrous materials. 	annealing for tool steels, Tool failures due to improper heat treatment like Overheating, Improper quenching and loading. ION Nitrating, Vacuum carburizing, Chemical Vapor depositing. Heat treatment of non-ferrous materials- Aluminum Alloys.		
UNIT-IV	Manufacturing processes	<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> • Define and identify various manufacturing Processes. • Discuss process Capabilities. • Understand and explain sheet metal working. • Define and describe physical properties of Engineering materials. 	<p>Various manufacturing processes, degree of accuracy and finish obtainable, process capability studies. Methods of improving tolerances. Basic product design rules for Casting, Forging. Machining, Sheet metal and Welding. Physical properties of engineering materials and their Importance on products. Selection of plastics, rubber and ceramics for product design.</p>	6	
UNIT-V	Industrial Ergonomics	<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> • Summaries and define man machine consideration • Explain man machine information exchange • Implement and describe JIT , KANBAN • Describe quality function development • Explain concept of Rapid Prototyping • Define and implement Modern approaches to product design. 	<p>Man-machine considerations, ease of maintenance. Ergonomic considerations in product design- Anthropometry, Design of controls, man-machine information exchange. Process sheet detail and their importance, Advanced techniques for higher productivity. Just-in-time and Kanban System. Modern approaches to product design; quality function development, Rapid prototyping</p>	6	

COURSES / MODULE TEMPLATE

NOS /Module: Design of Tools with Advance CAD Software Module II

NOS /Module Code: MSME/PGDTD/11

Outcomes:

After completion of course Student should be able to:

1. Understand and Explain the concept of Toolings
2. Recognise the needs of Tool designing with the help of advance 3d CAD Software (Creoparametric)
3. Understand advance 3D CAD Software (Creoparametric) as compare to other Advance CAD software.
4. Create 2D geometric sketches by using UG &CATIA software.
5. Develop 3D solid & surface modeling by using advanced command.
6. Understand assembly constraint & develop different types of assembly design.
7. Apply knowledge in create complicated modeling & creative/innovative Design solutions.
8. Create Tool Parts Models, Assembly and Drafting with the help of advance 3d CAD Software - Creoparametric
9. Able to Analyze and understand customers need
10. Able to Discuss and finalize product needs
11. Prepare Conceptual design and finalize
12. Test against standards and parameters
13. develop 2D and 3D model using advance 3d CAD Software
14. Interpret of output
15. Apply CAD in Tool Design.

Theory Hours: - Practical Hours: -60

Theory Marks:

Practical Marks: -60

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH Hours	PR hours
Unit I	Introduction	At the end of this Unit the student should be able to: <ul style="list-style-type: none"> • Understand advance computer aided design • Understand various workbenches& able to Pro-e user interface. • Have Knowledge in various commands & various visualization. 	Tool Design Concept Introduction to pro-e& various workbenches, Pro e user interface, Tool Bar Customization, Various Visualization commands.		10

		<ul style="list-style-type: none"> Differentiate various CAD software to Pro-e. 			
UNIT-II	Sketcher	<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> 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. 	<p>Sketching in proe, 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 based projects.</p>		10
UNIT-III	Part Design	<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> Understand 3D Modeling concept. Use various workbench based feature. Create 3D model design. Illustrate advanced Transformation features. Use and create Surface Based Features 	<p>Various workbench based features viz. pad, pocket, shaft, Groove, Hole 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. Sweep, Helical sweep, Volume helical sweep, swept blend, Blend, Rotational blended Rib, Draft Cosmetic sketch, Cosmetics Thread, Cosmetics Groove, Designated Area, Lattice etc</p>		10

UNIT-IV	Advanced Command Part Modeling And Surfacing	<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> • Execute various surface creation methods. • Understand & apply Operation tools. • Understand advanced commands. • Create surface model. • Perform advanced solid & surface modeling 	<p>Tweak features. 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. Pattern, Trim, Merge, Intersect, Solidify, Thicken, Project, Warp, Spilt Surface, Remove, Boundary Blend, Fill, Style, Restyle, Vertex Round, Flatten Quilt, Flatten Quilt Deformation, Freestyle, Family Table etc</p>		10
UNIT-V	Assembly	<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> • Understand concept of assembly constraint. • Understand difference between bottom up and Top down assembly. • To develop Assembly model. • Create Bill of material. • Execute Tool Assembly Modelling 	<p>Various Assembly constraints. Working with bottom up and top down assembly. Design in context. Generating bill of material. Tool Develop & design Mechanism,</p>		10
UNIT-VI	Generative And Interactive Drafting	<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> • Understand concept of Drafting. • Understand different types of view. • Use different engineering symbols. • Execute drafting based tool design 	<p>Creating various views through wizard. Creating various section views. Drawing model, General view, Projection view, detailed view, Component display, Edge display, Auxiliary view, Hatch fill, Convert to draft group, Convert to draft entities, Text style, Line style, Repeat</p>		10

			region, Create Balloons, Geometric Tolerance, Datum feature symbols, Hole table. Add a B.O.M. Adding text and labels. Dimensioning, Various engineering symbols, Translators. Tool Develop & design in Pro-e.		
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COURSES / MODULE TEMPLATE

NOS /Module: FEA using CAE Software

NOS /Module Code: MSME/PGDTD/12

Outcomes:

After completion of course Student should be able to:

1. Understand and Explain the concept of FEA and its Application in Analytical Simulation
2. Able to Analyze and understand customers need
3. Able to Discuss and finalize product and product analysis needs
4. Execute Preprocessing for Analytical Simulation
5. Test against standards and parameters
6. Perform Analysis using CAE software - ANSYS
7. interpret of output
8. apply CAE in Tool Design

Theory Hours: -

Practical Hours: -60

Theory Marks:

Practical Marks: 100

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH Hours	PR hours
Unit I	Introduction to FEA using CAE Software (ANSYS)	At the end of this Unit the student should be able to: <ul style="list-style-type: none"> • Understand Finite element method. 	Introduction to Finite Element Method of solving field problems using ANSYS workbench. User Interface of ANSYS Workbench Mechanical,		10

		<ul style="list-style-type: none"> • Work with ANSYS Graphical user interface • Describe stress strain relationship • solve static Analysis 	<p>Boundary conditions. Strain-Displacement relations. Stress-strain relations. One Dimensional Problem: Finite element modeling.</p> <p>Local, natural and global coordinates and shape functions. Quadratic shape functions, application of static Analysis with ANSYS Workbench Mechanical.</p>		
UNIT-II	1D Analysis	<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> • Understand the axial stress on trusses and frame • To apply proper remote boundary conditions • Knowledge of post processing • Evaluate the results of solution 	<p>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 noded, two degrees of freedom per node for beam element. Solving the using ANSYS Workbench Mechanical & details of result reading IN POST PROCESING.</p>		10
UNIT-III	2D ANALYSIS	<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> • To use of finite element modeling with ANSYS Workbench Mechanical • Apply boundary conditions in ANSYS Workbench Mechanical • Results reading • Optimization of analysis 	<p>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</p>		10

			and geometric isotropy To Subjected To Design Optimization And Parametric Of Post processing Result Of ANSYS Workbench Mechanical.		
UNIT-IV	Thermal Analysis	<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> • To have Fundamental knowledge of NON-LINER • To understand thermal behavior • To describe conduction, convection & radiation. • To use 1D & 2Delement of thermal. 	<p>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</p>		10
UNIT-V	3d Elements and Workbench	<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> • 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 	<p>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</p>		10

UNIT-VI	Dynamic transient analysis	<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> • Understand the dynamics of Analysis • Describe the steady state conditions over the analysis • To have validation of analysis • To execute the knowledge in tooling 	<p>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.</p>		10
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COURSES / MODULE TEMPLATE

NOS /Module: Additive Manufacturing

NOS /Module Code: MSME/PGDTD/13

Outcomes:

After completion of course Student should be able to :-

1. Understand and explain the Concept of Additive Manufacturing techniques
2. List and classify different RP techniques
3. Describe advantage and disadvantages of RP
4. Apply knowledge of RP & RE using 3D scanning and 3D printing in rapid prototype

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

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH hours	PR hours
UNIT-I	Introduction to Additive Manufacturing	At the end of this Unit the student should be able to: <ul style="list-style-type: none"> • To basic understanding of Rapid prototyping and manufacturing. • To understand the design potential in 3D Printing • To have knowledge of 3D Printing and 3D scanning • To describe design complexity. 	Introduction to rapid prototyping & 3D scanning, Concept of Additive Manufacturing definition of rapid manufacturing, Unlocking the design potential of rapid manufacturing potential of Rapid prototyping and manufacturing on design and material combinations	4	
UNIT-II	Additive Manufacturing Processes	At the end of this Unit the student should be able to: <ul style="list-style-type: none"> • To apply basic CAD properties • Use the 3D Printing to reconstruct the design • To get the dimensions over physical modal. 	CAD and Additive Manufacturing, relations between CAD and rapid prototyping, CAD for functionally graded materials, emerging rapid manufacturing processes, liquid based processes, powder based processes and solid based process.	6	
UNIT-III	Working Principal & Post Processes	At the end of this Unit the student should be able to: <ul style="list-style-type: none"> • To have basic knowledge of materials • To use the concept of photo polymerization 	Material issue in rapid manufacturing. Role of materials in rapid manufacturing, Sintering, infiltration and materials for RM parts. Materials and processes control for rapid manufacture	6	

		<ul style="list-style-type: none"> Apply the processes control of 3Dprinting 			
UNIT-IV	Estimation and Costing	<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> To understand the basic cost estimation To apply costing parameter To describe the various cost estimation tools of 3D printing & 3D Scanning Able to work with different 3Dprinting process & technology. 	<p>Production economics of rapid prototyping Stereo lithography, selective laser sintering, fused deposition modeling, metal based processes. Machine cost material cost, labor cost, comparing the cost of rapid manufacturing with injection. Management and implementation of rapid manufacturing. Cost of manufacture, overhead Allocation and location and business cost.</p>	4	
UNIT-V	Application of Additive Manufacturing in Medical Sector	<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> Apply the knowledge in medical Understand the digital manufacturing Describe electronic and electronic modeling To use selective laser sintering(SLS),Stereo lithography apparatus(SLA) 	<p>Applications of rapid prototyping in medical, pre-surgery, limb prosthesis, rapid prototyping in the hearing industry. Manual manufacturing digital manufacturing & Electronic detailing. Applications 3D scanning.</p>	4	
UNIT-VI	Application of Additive Manufacturing in Automotive Sector	<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> To understand the applications of 3D printing & 3D scanning Evaluate the scope of 3D scanning & 3D printing Work with different Technology problem and proposed solutions To execute the knowledge in tooling. 	<p>Automotive applications, cooling duct, rapid manufacturing in the aeronautical industry, Aeronautical requirement for RP. Problems and proposed solutions, space applications, quality assurance, additive manufacturing technologies for the construction industry .RP for retail industry, fascinating technology, lighting, 3D textiles &</p>	6	

			limitations possibilities.		
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COURSES / MODULE TEMPLATE

COURSE NAME: INNOVATIVE DESIGN AND RESEARCH METHODOLOGY

COURSE CODE: MSME/PGDTD/14

COURSE OUTCOMES:

- To explain the concept of Innovation and its Various Strategies
- To explain the Innovation problem solving and its various processes and techniques
- To discuss the methods of Idea generation processes and techniques
- Select research methodology
- Define research problem
- Perform literature survey and review
- Design research problem
- Collect and analyses data
- Write report

THEORY HOURS: 60

PRACTICAL HOURS:

THEORY MARKS: 60

PRACTICAL MARKS:

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH Hrs.	PR Hrs.
UNIT-I	Innovation Overview	At the end of this unit student should be able to: <ul style="list-style-type: none"> • Understand and Explain the concept of Innovation • Innovation Strategies 	Challenges and need to innovate Innovations vs. inventions Innovation strategies Managed innovation frameworks Enterprise Architecture guided innovation Top down strategy Bottom up strategy	8	
UNIT-II	Innovation strategy Processes and techniques	At the end of this unit student should be able to: Understand Innovation problem solving, various processes and techniques	inventive problem solving Four lenses of innovation Orthodoxies and why they matter Prioritizing a problem statement innovation strategy mainstream offerings	8	
UNIT-III	Research Methodology	At the end of this unit student should be able to: <ul style="list-style-type: none"> • Understanding of the research methodology • Identify the research Process • Describe the research Process • Approach to Technique involved in Defining a Problem. 	Research Methodology: Objectives and Motivation of Research, Types of Research, Research Approaches, Significance of Research, Research Methods Verses Methodology, Research and Scientific Method, Importance of Research Methodology, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India, Benefits to the society in general. Defining the Research Problem: Definition of Research Problem, Problem Formulation, Necessity of Defining the Problem, Technique involved in Defining a Problem.	12	
UNIT-IV	Literature Survey	At the end of this unit student should be able to: <ul style="list-style-type: none"> • Able to rectify problem 	Literature Survey: Importance of Literature Survey, Sources of Information, Assessment of Quality of Journals and Articles, Information	8	

		<ul style="list-style-type: none"> • Understating of Assessment of Quality of Journals and Articles • Identify the guideline of research and review 	through Internet. Literature Review: Need of Review, Guidelines for Review, Record of Research Review.		
UNIT-V	Research Design	<p>At the end of this unit student should be able to:</p> <ul style="list-style-type: none"> • Basic understanding of the research design • Selection of the best or convince research methodology • Able to develop the plan of the research • Identifying the design of experiment 	Research Design: Meaning of Research Design, Need of Research Design, Feature of a Good Design, Important Concepts Related to Research Design, Different Research Designs, Basic Principles of Experimental Design, Developing a Research Plan, Design of Experimental Set-up, Use of Standards and Codes.	8	
UNIT-VI	Data Collection and Data Analysis	<p>At the end of this unit student should be able to:</p> <ul style="list-style-type: none"> • Understanding the data reading and collection for future scope of the research domain • Apply the different parameter • Use the various statics-estimation • Developing the core research testing and statically value • Using the various analysis 	Data Collection: Exploring the data, Description and Analysis of Data, Sample Design and Sampling, Role of Statistics for Data Analysis, Functions of Statistics, Parameters, Parametric V/s Non Parametric methods, Descriptive Statistics, Data Analysis: Deterministic and random data, Uncertainty analysis, Tests for significance	8	
UNIT-VII	Research Report Writing	<p>At the end of this unit student should be able to:</p> <ul style="list-style-type: none"> • Basic understating of format style • Using deferent report writing format • able to Developed and prepare technical paper writing and presentations 	Research Report Writing: Format of the Research report, Style of writing report, References/Bibliography/ Webliography, Technical paper writing/Journal report writing. Research Proposal Preparation: Writing a Research Proposal and Research Report, Writing Research Grant Proposal.	8	

		<ul style="list-style-type: none">• Describe the design of research paper format and proposal preparation.			
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COURSES / MODULE TEMPLATE

NOS /Module: EMPLOYABILITY SKILLS / ENTREPRENEURSHIP

NOS /Module Code: MSME/ES/12

Outcomes:

After completion of course Student should be able to

- 1) Developing a detailed understanding of entrepreneurship along with the perspective of initiating and propelling new ventures.
- 2) Developing the linkage between strategy, innovation, entrepreneurship and creativity.
- 3) Inculcating the role of Intellectual Property perspective and Innovation as the key to entrepreneurship

THEORY HOURS: -120 PRACTICAL HOURS: THEORY MARKS: - 100 PRACTICAL MARKS:

UNIT-I	INTRODUCTION TO EMPLOYABILITY SKILLS	<p>At the end of unit</p> <ul style="list-style-type: none"> • understand the significance of employability skills in meeting the current job market requirement and future of work. • identify and explore learning and employability relevant portals 	<ul style="list-style-type: none"> ➤ Discuss the Employability Skills required for jobs in various industries. ➤ List different learning and employability related GOI and private portals and their usage. ➤ Research and prepare a note on different industries, trends, required skills and the available opportunities 	3	
UNIT II	CONSTITUTIONAL VALUES – CITIZENSHIP	<ul style="list-style-type: none"> • recognize the significance of constitutional values, including civic rights and duties, citizenship, responsibility towards society etc. for personal growth and the nation's progress • follow personal values and ethics such as honesty, integrity, caring and respecting others, etc. • follow and promote environmentally sustainable practices 	<ul style="list-style-type: none"> ➤ Explain the constitutional values, including civic rights and duties, citizenship, responsibility towards society etc. that are required to be followed to become a responsible citizen ➤ Discuss the role of personal values and ethics such as honesty, integrity, caring and respecting others, etc. in personal and social development ➤ Identify and practice different environmentally sustainable practices 	3	

UNIT III	BECOMING A PROFESSIONAL IN THE 21ST CENTURY	<ul style="list-style-type: none"> • recognize the significance of 21st Century Skills for employment • practice the 21st Century Skills such as Self-Awareness, Behavior Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn etc. in personal and professional life 	<ul style="list-style-type: none"> ➤ Discuss relevant 21st century skills required for employment ➤ Highlight the importance of practicing 21st century skills like Self-Awareness, Behavior Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn etc. in personal or professional life ➤ Create a pathway for adopting a continuous learning mindset for personal and professional development 	5	
UNIT-IV	BASIC ENGLISH SKILLS	<ul style="list-style-type: none"> • use English as a medium of formal and informal communication while dealing with topics of everyday conversation in different contexts • read and understand routine information, instructions, emails, letters etc. written in English • write short messages, notes, letters, e-mails etc., using accurate English 	<ul style="list-style-type: none"> ➤ Use appropriate grammar and sentences while interacting with others ➤ Read English text with appropriate articulation ➤ Role play a situation on how to talk appropriately to a customer in English, over the phone or in person ➤ Write a brief note/paragraph / letter/e -mail using correct English 	20	
UNIT V	CAREER DEVELOPMENT & GOAL SETTING	<ul style="list-style-type: none"> • identify career goals based on the skills, interests, knowledge, and personal attributes • prepare a career development plan with 	<ul style="list-style-type: none"> ➤ Create a career development plan ➤ Identify well-defined short- and long-term goals 	4	

		short- and long-term goals.			
UNIT VI	COMMUNICATION SKILLS	<ul style="list-style-type: none"> • follow verbal and non-verbal communication etiquette while communicating in professional and public settings • use active listening techniques for effective communication • communicate in writing using appropriate style and format based on formal or informal requirements 	<ul style="list-style-type: none"> ➤ . Demonstrate how to communicate effectively using verbal and nonverbal communication etiquette ➤ Write a brief note/paragraph on a familiar topic ➤ Explain the importance of communication etiquette including active listening for effective communication ➤ Role play a situation on how to work collaboratively with others in a team 	10	
UNIT VII	DIVERSITY & INCLUSION	<ul style="list-style-type: none"> • ensure personal behavior, conduct, and use appropriate communication by taking gender into consideration • empathize with a PwD and aid a PwD 	<ul style="list-style-type: none"> ➤ Exhibit how to behave, communicate, and conduct oneself appropriately with all genders and PwD ➤ Discuss the POSH Act and its significance 	5	
UNIT VIII	FINANCIAL AND LEGAL LITERACY	<ul style="list-style-type: none"> • Discuss various financial institutions, products, and services • Demonstrate how to conduct offline and online financial transactions, safely and securely and check passbook/statement • Explain the common components of salary such as Basic, PF, Allowances (HRA, TA, DA, etc.), tax deductions 	<ul style="list-style-type: none"> ➤ Discuss various financial institutions, products, and services ➤ Demonstrate how to conduct offline and online financial transactions, safely and securely and check passbook/statement ➤ Explain the common components of salary such as Basic, PF, Allowances (HRA, TA, DA, etc.), tax deductions ➤ Calculate income and expenditure for budgeting ➤ Discuss the legal rights, laws, and aids 	10	

		DA, etc.), tax deductions			
UNIT-IX	ESSENTIAL DIGITAL SKILLS	<ul style="list-style-type: none"> • operate digital devices and use their features and applications securely and safely • carry out basic internet operations by connecting to the internet safely and securely, using the mobile data or other available networks through Bluetooth, Wi-Fi, etc. • display responsible online behavior while using various social media platforms 	<ul style="list-style-type: none"> ➤ . Describe the role of digital technology in day-to-day life and the workplace ➤ Demonstrate how to operate digital devices and use the associated applications and features, safely and securely ➤ Demonstrate how to connect devices securely to internet using different means ➤ Follow the dos and don'ts of cyber security to protect against cyber crimes ➤ Discuss the significance of displaying responsible online behavior while using various social media platforms ➤ Create an e-mail id and follow e-mail etiquette to exchange e-mails ➤ Show how to create documents, spreadsheets and presentations using appropriate applications ➤ utilize virtual collaboration tools to work effectively 	20	
UNIT-X	ENTREPRENEURSHIP	<ul style="list-style-type: none"> • identify different types of Entrepreneurship and Enterprises • use research and networking skills to identify and assess opportunities for potential business • develop a business plan and a work model, considering the 4Ps of Marketing- Product, Price, Place and Promotion 	<ul style="list-style-type: none"> ➤ . Describe the types of entrepreneurship and enterprises ➤ Discuss the process of identifying opportunities for potential business and relevant regulatory and statutory requirements ➤ Describe the 4Ps of Marketing- Product, Price, Place and Promotion and apply them as per requirement ➤ Create a sample business plan, for the selected business opportunity ➤ Discuss various sources of funding and identify associated financial and legal risks with its mitigation plan 	15	

UNIT- XI	CUSTOMER SERVICE	<p>identify different types of customers</p> <p>identify and respond to customer requests and needs in a professional manner</p> <p>use appropriate tools to collect customer feedback</p>	<ul style="list-style-type: none"> ➤ Describe different types of customers ➤ Role play a situation on how to identify customer needs and respond to them in a professional manner ➤ Explain various tools used to collect customer feedback ➤ Discuss the significance of maintaining hygiene and dressing appropriately 	10	
UNIT- XII	GETTING READY FOR APPRENTICE SHIP & JOBS	<ul style="list-style-type: none"> • create a professional Curriculum vitae (Résumé) • search for suitable jobs using reliable offline and online sources • apply to identified job openings using offline /online methods as per requirement • answer questions politely, with clarity and confidence, during recruitment and selection 	<ul style="list-style-type: none"> ➤ Draft a professional Curriculum Vitae (CV) ➤ Use various offline and online job search sources such as employment exchanges, recruitment agencies, and job portals respectively ➤ Demonstrate how to apply to identified job openings using offline /online methods as per requirement ➤ Discuss how to prepare for an interview ➤ Role play a mock interview ➤ List the steps for searching and registering for apprenticeship opportunities 	15	

