



**ADVANCE CERTIFICATE
COURSE IN TOOL DESIGN &
CAD CAM**



curriculum

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

SEMESTER: I

COURSE NAME: CNC PROGRAMMING AND CNC MACHINING

COURSE CODE:

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

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

THEORY HOURS: 40

PRACTICAL HOURS: 120

THEORY MARKS: -

PRACTICAL MARKS: 60

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH hours	Marks	
UNIT-I	Introduction to CNC technology and CNC programming	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• Understand the importance and use of PPE's	Introduction to CNC technology – CNC machines & controls. History & development of CNC technology. Conventional Vs. non-conventional machine tool. Numerical control on CNC machine tools CNC control and CNC Control and types of CNC control Calculation of technological data for CNC machining. CNC clamping system. Implementation of JH for CNC Basic health and safety CNC programming basics. Introduction to manual NC programming Manual NC programming for lathe & milling machines. Application Numerical Control, Advantages, &	6	8	

			Disadvantages, Adoptive Control System. Practical training & workshop for above sub topics on CNC Machine.			
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 • Prepare and understand line program for various profiles • Identify and set parameters for various simulators • Prepare and simulate various operation cycles for lathe and milling • Use and simulate cycles using various Controls • Knowledge of the parameters for various machining cycles and operations 	<p>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 and milling machines using different machining cycles into the CNC simulator. Procedures Associated with part programming, Cutting process parameter selection, Process planning issues and path planning, G & M Codes, Interpolations, Canned Cycles and Subprograms, Tool compensations Exposure for programming and simulator of FANUC, SINUMERIC, DMG TURNPLUS & Controls through post processors. Programming exercise. Machining of programmed exercise on CNC lathe & milling machines.</p>	6	10	
UNIT-III	CNC Machining – Lathe	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • 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. 	<p>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</p>	8	12	

UNIT-IV	CNC Machining – Milling	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • 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. 	<p>Plan and optimize programs for CNC Milling operations.</p> <p>Calculate parameters like speed feed , depth of cut etc. and set a references for the various operations</p> <p>Various methods of work process like edge finding block center etc.</p> <p>Prepare & set CNC Milling operations and test run programmed</p> <p>Execute program and inspect simple geometrical forms / standard parts</p> <p>Use of various PPE's on CNC milling machine</p>	6	8	
UNIT-V	CNC Machining – EDM & WEDM	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Calculate parameters for EDM and WEDM operations • Understand the parameters related to surface finish of work parts • Explain operation sequence for the operations • Calculate and set various parameters of the EDM and WEDM machines • Explain and describe difference between EDM and WEDM 	<p>Plan and optimize programs for CNC Wire EDM operations.</p> <p>Calculate parameters affecting surface finish</p> <p>Calculate various machining parameters like Ip, voltage etc</p> <p>Prepare & set CNC Wire EDM operations and test run programmed</p> <p>Execute program and inspect simple geometrical forms / standard parts</p> <p>Plan and optimize programs for CNC EDM operations.</p> <p>Prepare & set CNC EDM operations and test run programmed</p> <p>Execute program and inspect simple geometrical forms / standard parts</p> <p>Use of various PPE's on CNC milling machines</p>	6	10	
UNIT-VI	Modern CNC Systems	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Explain and use Indexable tools • Describe and use ATC and explain its applications 	<p>Indexable carbide tools, Modular Tooling & Tool Presetting, Machining Centers, Automatic tool changers</p> <p>Introduction to advanced cnc systems like HSM, RP,CIM</p>	8	12	

		<ul style="list-style-type: none">• Describe advanced CNC systems and its applications• Explain the importance of Computer Aided Part Programming	Importance and application of advanced CNC systems Computer Aided Part Programming Part Program Generation through Pro E/Del CAM Post Processors Computations for part programming			
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SEMESTER: I

COURSE NAME: Computer Aided Design (CAD-Auto CAD/Collab CAD and Solid works)

COURSE CODE:

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

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

THEORY HOURS: PRACTICAL HOURS: 120

THEORY MARKS:

PRACTICAL MARKS: 60

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	PR hours	Marks	
UNIT-I		At the end of this Unit the student should be able to: <ul style="list-style-type: none">• 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 CAD, Solid Work. Description of the feature that have been added or changed since new Release CAD. Criteria for selection of CAD workstations, Shingle Design Process, Design criteria, Geometric modeling, entities, 2D & 3D Primitives. Different Types of cad software. Also comparison of various CAD Software. CAD software features. Concept of hardware & software.	20	8	
UNIT-II		At the end of this Unit the student should be able to: <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	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,	20	10	

			Geometrical Dimension, Tolerance method in AUTOCAD.			
UNIT-III		<p>At the end of this Unit the 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 / 3d modelling. • 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>	20	12	
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 Collab CAD. • Understand 2D drawing generation with dimensioning & detailing. • Create and Modification of Surface Entities Trimming and Lofting of Surfaces, Surface Diagnostics, Reflection Line Analysis. • Create Solid Modeling and Feature Based Part Modeling. • Understand Assembly- Constraint based Parametric Profile Editing and 3D Constraint Solver. 	<p>Capability of Collab CAD Software and Brief Introduction to Collab CAD. Introduce Collab CAD Modeling Philosophy & PLM Strategy. Build and Edit entities in Virtual 3D Space, 2D Profile and free hand Sketching, Plot Configurator, Generation of 2D Drawings, Dimensioning and Detailing. Creation and Modification of Surface Entities Trimming and Lofting of Surfaces, Surface Diagnostics, Reflection Line Analysis. Generate complex Surfaces and Curves from a set of Points obtained from Raw/Scanned Data Create Solid Modeling Primitive Solids Slab, Revolution Solid, Sweep Solid Boolean operations, Mass and Section property calculations, Sectioning, Slicing, and Feature Based Part Modeling. Assembly- Constraint based Parametric Profile Editing and 3D Constraint Solver.</p>	20	8	

UNIT-V		<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> • 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. 	<p>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.</p>	20	10	
UNIT-VI		<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</p>	20	12	

SEMESTER: I

COURSE NAME: Computer Aided manufacturing. (Master CAM & Unigraphics CAM)

COURSE CODE:

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

- Understand capabilities of CAM Software like Master CAM & UG CAM.
- Create 2D geometric sketches by using Master CAM & UG CAM.
- Understand 3D solid & surface terminology.
- Clarify the Concept of CNC Programming.
- Understand Post processing.
- Execute & generate various Milling, Lathe, EDM operations NC program.

THEORY HOURS: PRACTICAL HOURS: 120

THEORY MARKS: PRACTICAL MARKS: 60

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	PR hours	Marks	
UNIT-I		<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none">• Understand capabilities of CAM Software like Master CAM & UG CAM.• Understand scope of software.• Understand difference between CAM/CAD/CAE software.• Understand various CAM software compare to Master CAM & UG CAM.	Capability of CAM Software and Introduction to Master CAM and Unigraphics CAM. Scope of CAM software in Market advantages of CAM. Introducing CNC machining by using CAM. Distinguish between Various types of CAM software and Master CAM and Unigraphics CAM. CAD software features. Concept of hardware & software.	05	8	
UNIT-II		<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.	Introduction to master CAM environment. 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 NURBS Spline, Break Drafting etc. Transformation of object - Mirror, Rotate, Translate, Scale. Selection Methods Creating Groups / Masking of entities / Assigning / Changing colors. Chain / Window / Area / Group / Delete / Undelete / Undo.	25	10	

			Transformation of object - Mirror, Rotate, Translate, Scale.			
UNIT-III		<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> • Understand Plane concept. • Understand Wireframe 3D modeling. • Create surface modeling by use modification & editing surface feature. • Understand solid terminology • Create Drafting with all Engineering symbols & dimensions. 	<p>Plane concepts. Wireframe Modelling: 3D Wireframe, normal, entity, rotated, named, number. Surface terminology. Modification of surfaces and 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>	25	12	
UNIT-IV		<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. • Understand Post processing. • Understand NC program Transfer to machine. 	<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. 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 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.</p>	25	8	
UNIT-V		<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> • Understand capabilities of UG CAM. • Understand CAM concept, Master Model concept. 	<p>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,</p>	20	10	

		<ul style="list-style-type: none"> Understand Manufacturing application. 	Creating new operation. Manufacturing applications, Saving part file, closing part file.			
UNIT-VI		<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> Understand Various Milling and Lathe operations by using Unigraphics CAM. Execute various drilling, reaming operation & hole making etc. Understand various boundary setting. Execute all milling & lathe operation by using UG CAM. Understand Wire EDM, EDM operation. Understand generate Wire EDM Operation. 	<p>Various Milling and Lathe operations by using Unigraphics CAM. Point to point machining. Creating drilling & reaming operation and hole making. Planner mill overview Profiling, Single level, Multi-level. Multi region, Creation of Boundaries. Setting Custom Boundary Member Data Setting Drive Cutting Method, Ramping method. Cut types, Trim boundary, and Uncut Region boundary. Creating Cavity Milling operation. Blank Geometry and offset, Uses of cutting option. Creating fixed contour operation. Lathe cross section, common turning parameters. Rough & Finish turning, What is wire EDM, EDM dialog overview? Wire EDM operation, creating Wire EDM Operation. Internal & External Trim operation</p>	20	12	

SEMESTER: I

COURSE NAME: DESIGN OF JIGS, FIXTURES AND GAUGES

COURSE CODE:

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

- Understand clearly the tool design parameters of Jigs, fixtures and Gauges
- Design against standard and parameters
- Apply design principles to Basic problem
- Execute output and confirming to specifications
- Collecting data related to design and manufacturing
- Communicate with manufacturing line

THEORY HOURS: 40

PRACTICAL HOURS: 80

THEORY MARKS: 60

PRACTICAL MARKS:60

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH Hrs.	Marks	
UNIT-I		At the end of this unit student should be able to: <ul style="list-style-type: none">• Describe and classify locating elements• Explain locating principle and methods• Select locating devices• Use standard parts	Locating Elements: Introduction, Jigs (Production Devices), Locating Principle, Locating methods and devices, Standard parts and their selection	6	10	
UNIT-II		At the end of this unit student should be able to: <ul style="list-style-type: none">• Describe and classify devices• Explain working of Pneumatics and hydraulic actuation clamping• Determine clamping force• Interpret tolerance in design	Clamping Devices: Introduction, Pneumatics and hydraulic actuation clamping, Analysis of clamping force, Tolerance and error analysis	6	12	
UNIT-III		At the end of this unit student should be able to: <ul style="list-style-type: none">• Understand design of jigs• Design procedure for different jigs• Select material in Jig design• Determine economic justification of use of jigs and fixture	Design of Jigs: Introduction, drill bushes, elements of jig, construction, material for jig elements, different types of jigs-plate jig, table jig, box jig, indexing device, multi station jig, economic justification for jigs and fixtures, clearances and selection of jigs	8	12	
UNIT-IV		At the end of this unit student should be able to:	Design of fixtures: Introduction, Design	8	12	

		<ul style="list-style-type: none"> • Understand design of fixture • Design procedure for different fixture • Select material in fixture design • Maintenance of Fixture • Use of CAD/CAM in Jigs and Fixture Design 	principles of fixtures, types of fixture, general principles of boring fixtures, classification of boring fixture, lathe fixture, , Milling fixture, Grinding fixture, Inspection Fixture, welding fixture			
UNIT-V		<p>At the end of this unit student should be able to:</p> <ul style="list-style-type: none"> • Explain and Classify Gauges • Understand design of gauges • Design procedure for different gauges 	Design of Gauges: Introduction, Types of gauges-plug gauge, snap gauge, profile gauge, Gauge design Practices, Design principles of gauges	10	14	

SEMESTER: I

COURSE NAME: DESIGN OF PRESS TOOLS

COURSE CODE:

COURSE OUTCOMES:

After completion of course Student should be able to

- Understand clearly the tool design parameters of Press Tools
- Design against standard and parameters
- Understand basic design principles to specific problem
- Interpret of output and confirming to specifications
- Collecting data related to design and manufacturing
- Communicate with manufacturing line

THEORY HOURS: 40

PRACTICAL HOURS: 120

THEORY MARKS: 60

PRACTICAL MARKS: 60

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH Hrs.	Marks	
UNIT-I		At the end of this unit student should be able to: <ul style="list-style-type: none">• Understand and classify Press machines• Describe the characteristics of press machines• Understand feeding and unloading equipment	Classification of Mechanical, Hydraulic, and pneumatic presses, Press Characteristics, safety devices in presses. Principles of stretch forming machines, principles of feeding and unloading equipment	6	10	
UNIT-II		At the end of this unit student should be able to: <ul style="list-style-type: none">• Explain shearing theory• Explain tooling• List different type of tools• Perform mathematical calculations for designing• Will be able to calculate best economy for production.	Design of Dies: Introduction terminology shearing dies- types of dies– size and tolerances of die opening and punch – force, power, energy, shearing with inclined edges – strip layouts, economical stock – Utilization.	6	12	
UNIT-III		At the end of this unit student should be able	Elements of shearing dies – die plates, inserts,	8	12	

		<p>to</p> <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 	<p>types of punches, punch holders, punches – strippers – calculation of springs and rubber ejector, shedders, stops – pilots – stock guides – alignment system design for press tools.</p>			
UNIT-IV		<p>At the end of this unit student should be able to</p> <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 	<p>Introduction to Compound dies, progressive dies, Bending dies, theory of bending development of blank, spring back, curling, flanging and press brake</p>	8	12	
UNIT-V		<p>At the end of this unit student should be able to</p> <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 	<p>Basics of Drawing and forming Dies: Theory of drawing, blank development, calculation of force, construction of drawing and drawing dies – Drawing of rectangular components (development, stages draw beads, Defects in deep drawing</p>	10	14	

SEMESTER: I

COURSE NAME: DESIGN OF MOULDS

COURSE CODE:

COURSE OUTCOMES:

After completion of course Student should be able to

- Understand clearly the tool design parameters of Moulds
- Design against standard and parameters
- Understand basic design principles to specific problem
- Interpret of output and confirming to specifications
- Collecting data related to design and manufacturing
- Communicate with manufacturing line

THEORY HOURS: 40

PRACTICAL HOURS: 120

THEORY MARKS: 60

PRACTICAL MARKS: 60

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH Hrs.	Marks	
UNIT-I		At the end of this unit student should be able to: <ul style="list-style-type: none">• Describe terminology in moulds• Understand different types moulds• List elements of moulds• Describe the functions of element / component of tools	Basic terminology in moulds, Mould cavities and cores, Basic Terminology injection, ejector plate assembly, ejection techniques, ejection from fixed half, sprue pullers, feed system – runner, gates	6	10	
UNIT-II		At the end of this unit student should be able to: <ul style="list-style-type: none">• To select standard moulds system• To Clarify select best option among various option available• To explain significance of parting surface	Introduction to Parting surface –general, flat parting surface, non-flat parting surface, venting. Mould cooling – general, cooling insert-type mould plates, Standard mold system – general considerations, standard two-parts mould systems,	6	12	

UNIT-III		<p>At the end of this unit 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 	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.	8	12	
UNIT-IV		<p>At the end of this unit 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 	Basics of Mould for thread components – general, moulds for internally threaded components, moulds for externally threaded components, mould construction. Multi-day light moulds – general, underfeed moulds, standard parts for underfeed moulds.	8	12	
UNIT-V		<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 	Basic Procedure for designing an injection mould – general, primary positioning of inserts, ejector system, complete the top half the drawing, complete the plan view, complete the cross-section, complete drawing and checking mould drawings	10	14	

SEMESTER: II

COURSE NAME: DESIGN OF DIE CASTING DIES

COURSE CODE:

COURSE OUTCOMES:

After completion of course Student should be able to

- Understand clearly the tool design parameters of Design of Die Casting Dies
- Design against standard and parameters
- Apply design principles to specific problem
- Interpret of output and confirming to specifications
- Collecting data related to design and manufacturing
- Communicate with manufacturing line

THEORY HOURS: 40

PRACTICAL HOURS: 80

THEORY MARKS: 60

PRACTICAL MARKS: 60

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH Hrs.	Marks	
UNIT-I		At the end of this unit student should be able to: <ul style="list-style-type: none">• Describe and classify Die Casting machines• Classify Dies along with general die details• Explain various theoretical and practical aspect of die 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	10	15	
UNIT-II		At the end of this unit student should be able to: <ul style="list-style-type: none">• To knowledge of select parting line• To perform design calculations• Understand and design various parameters in Die casting Die• Compare Die casting with other production processes	Basic 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, electroplated parts, designing for economy of production, comparison of Die Casting with other production processes	10	15	

UNIT-III		<p>At the end of this unit student should be able to:</p> <ul style="list-style-type: none"> •Understand characteristics of die steels` •to Knowledge Select steels for Die Casting •Select different Die casting alloys •Understand finishing and machining of Die casting 	<p>Introduction to Die Steels and alloys: required characteristics of die steels, quality control of die steel, selection of steels for Die Casting Dies, heat treatment of die steels.</p>	10	15	
UNIT-IV		<p>At the end of this unit 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 Tool 	<p>Basics 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>	10	15	

SEMESTER: II

COURSE NAME: Engineering Metrology and Quality Control

COURSE CODE:

COURSE OUTCOMES:

After completion of course Student should be able to

- Understand Various Principles of Measurements.
- Identify various Length Standards & Knowledge of Limits, Fits & Tolerances.
- Explain and demonstrate various gauges like NPL gauge
- Understand, define ,explain and review Taylor's principles of gauge design and Fixed & Indicating Gauges
- Classify & describe various measuring machines like Floating carriage diameter measuring m/c etc.
- Predict and examine various modes and types of errors and also the demonstration of devices used for measurement.
- Evaluate and do analysis of parameters of screw threads
- Determine and describe various methods of measurements of gear terminology

THEORY HOURS: 40

PRACTICAL HOURS:

THEORY MARKS: 60

PRACTICAL MARKS: -

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH hours	Marks	
UNIT-I		After completion of unit Student should be able to <ul style="list-style-type: none">• Understand the Principles of measurements.• List the various length standards• Knowledge of Limits, fits & tolerances Understand Gauges and its types	Principles of measurement: Definition of Metrology, difference between precision and accuracy. Length Standards: Line standards, end standards and wavelength standards, transfer from line standards to end standards Limits, fits and Tolerances: Different types of fits and methods to provide these fits. Numerical to calculate the limits, fits and tolerances as per IS 919-1963, Gauges and its types	6	10	
UNIT-II		After completion of unit Student should be able to <ul style="list-style-type: none">• Understand types of inspection• Inspection the measurement by using various Instrument like	Types of Inspection:- Inspection by Gauging: limit gauging, plug gauges, Ring gauges, position gauges Inspection by Measurement: Direct measurement such as Vernier Caliper, Vernier Height gauge, Vernier Depth gauge Outside Micrometer, Inside Micrometer, Depth	8	12	

		Vernier caliper, Micrometer, Gauges etc.	Micrometer, Slip gauges (gauge blocks), length bars , Bevel protractor etc.			
UNIT-III		<p>After completion of unit Student should be able to:</p> <ul style="list-style-type: none"> • Understand various features to Inspections. • Inspection Straightness & Flatness of various surface. • Understand screw thread & Gear Measurement. • Calibrate thread Measurement & Gear Measurement 	<p>Straightness and flatness: Feature inspection such as flatness, roundness, straightness, parallelism, etc. Surface texture, different types of irregularities, Measurement of various surface roughness parameters.</p> <p>Screw Thread Measurement: Measurement of elements of screw threads –major diameter, minor diameter, pitch, flank angle and effective diameter.</p>	8	12	
UNIT-IV		<p>After completion of unit Student should be able to :</p> <ul style="list-style-type: none"> • Understand Need of Quality & Assurance • Knowledge of various sampling methods 	<p>Introduction to Quality Assurance: Need of quality, Aspects of quality, Quality specification, and Quality function Shewhart's control charts for variables: X bar and R charts, operating characteristics curves, producer's risk, consumer's risk, Sampling inspection, single double and multiple sampling plan.</p>	8	12	

SEMESTER: II

COURSE NAME: Advanced-CAD (Unigraphics & CATIA)

COURSE CODE:

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

- Understand advance Computer aided design software (UG & Catia) as compare to other CAD software.
- Create 2D geometric sketches by using UG & Catia 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.

THEORY HOURS: PRACTICAL HOURS: 120

THEORY MARKS: PRACTICAL MARKS: 60

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	PR hours	Marks	
UNIT-I		At the end of this Unit the student should be able to: <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.• Understand difference between various software as compare to UG & Catia.• Execute the concept of hardware & software.	Capability of CAD Software and Introduction to Unigraphics & Catia. 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.	5	8	
UNIT-II		At the end of this Unit the student should be able to: <ul style="list-style-type: none">• Have fundamental knowledge of UG software.• Create complicated geometry sketch	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,	25	10	

		<ul style="list-style-type: none"> • 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. 	Revolving sketches. Adding Geometric & Dimensional Constraint to sketches.			
UNIT-III		<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> • Understand Working with Datum plane, Coordinate System, and datum axes. • Understand Advance Modelling Tool. • Apply advance editing, modifying, creating feature. • To execute Boolean, extrusion termination operations. • Create 3D model design. 	Working with Datum plane, Coordinate System, and datum axes. Specifying Boolean operation, Specification other Extrusion Termination option. Advance Modelling Tool like creating various types of Hole, Grooves, Slots, Dove-Tail Slots, Chamfer, and Edge Blend. Pattern Feature Tool, Mirror Feature Tool, and Sweeping Sketches along guide curve. Creating swept, Tubes or cables, Threads, Shell Features.	30	12	
UNIT-IV		<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 	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.	20	10	
UNIT-V		<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. • Create complicated geometry sketch • Understand Adding Geometric & Dimensional Constraint to sketches. 	Introduction to Catia and Important Technical Terms & Definitions. Understand function of Tool bar, hot keys, Color Scheme etc. Drawing Display Tools like Zoom In, Zoom Out, Pan etc. Drawing sketches in Sketcher work bench. Using sketching tools like lines, Center Lines, Rectangle, Point, and Circle etc. Editing and Modifying Tools.	25	10	

		<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. • Create 3D model by using various sketch based features. • Understand operation, transformation, and dress up feature, hole & editing feature tool bars. 	<p>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, Boolean operations. Wireframe and surface design feature. Wire frame geometry, surface creation methods Extrude, revolve, spheres, offset, fill, swept, loft, blend, Join, healing, untrimmed, disassemble, split, trim, boundary curves, extract geometry. Operation on a shape geometry Translate, symmetry, scaling affinity, rotate, nearest, extrapolate</p>			
UNIT-VI		<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 	<p>Assembly Modeling. Creating Bottom up Assemblies & Top- down Assemblies. Editing Assembly Features. Working with Drafting Work bench. Types of Views, generating automatically & manually Drawing View. Adding Various Dimensions, Tolerances, Datum, Surface finish , Welding symbols etc.</p>	15	20	

SEMESTER: II

COURSE NAME: Manufacturing process-process planning and heat treatment

COURSE CODE:

COURSE OUTCOMES:

After completion of Course Student should be able to

- Describe, explain and Classify Engineering material and explain physical properties of materials.
- Evaluate tensile strength percentage of elongation etc. & Annalise Fatigue and Creep testing, testing for Residual stresses
- Explain Selection and specification of carbon and alloy steels and also Describe types of modern Cutting Tool materials
- Understand and explain concept of hardenability, define and explain Austempering, Martempering and Isothermal annealing
- Define and identify various manufacturing processes , Discuss process capabilities
- Understand and explain sheet metal working , its applications and limitations
- Summaries and define man machine consideration and Explain man machine information exchange
- Implement and describe JIT, KANBAN. Describe quality function development

THEORY HOURS: 40

PRACTICAL HOURS:

THEORY MARKS: 60

PRACTICAL MARKS:

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH hours	Marks	
UNIT-I	Classification of materials	After completion of unit Student should be able to <ul style="list-style-type: none">• Explain and describe Crystal Structure• Define relation of grain size and relation to mechanical properties.• Review and brief discussion on stress strain• Annalise Fatigue and Creep testing, testing for Residual stresses	Basic Types and Crystal Structures. Imperfections. Strain hardening, Plastic range, Fracture, Fatigue, Creep and Creep properties. Recovery. Recrystallizations and Grain growth. Primary and secondary recrystallization and sub-grain structure. Mechanism of strengthening in metals. Review and brief discussion on stress strain diagram of steel and the parameters for ductility toughness, strain hardening, Fracture toughness and crack growth measurement.	8	12	
UNIT-II	Tool Materials	After completion of unit Student should be able to <ul style="list-style-type: none">• Explain Selection and specification of carbon and alloy steels	General Selection and specification of carbon and alloy steels for general engineering purpose, Specification of materials as per various standards (IS, BS, AISI, APS etc.) Types of modern Cutting Tool	8	12	

		<ul style="list-style-type: none"> Describe types of modern Cutting Tool materials Define and explain Properties of plastic 	materials like Carbide, Coated carbides, Ceramics, CBN, Diamond, Impregnated tools. Introduction to Plastics. Properties of plastics-Thermoplastics-Thermosetting plastics.			
UNIT-III	Heat treatment	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> Understand and explain concept of hardenability Define and explain Austempering, Martempering 	Introduction to Hardenability, its concepts and its role in steel specification. Hardening and annealing of tool steels. Case hardening and local hardening, Austempering, Martempering	8	12	
UNIT-IV	Manufacturing processes	<p>After completion of unit 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 	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	8	12	
UNIT-V	Industrial ergonomics:	<p>After completion of unit 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 Explain concept of Rapid Prototyping 	Man-machine considerations, ease of maintenance. 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	8	12	

SEMESTER: II

COURSE NAME: ENTREPRENEURSHIP

COURSE CODE:

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

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

THEORY HOURS: 40

PRACTICAL HOURS:

THEORY MARKS: --

PRACTICA MARKS:--

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH hours	Marks
UNIT-I	ENTREPRENEURSHIP AND THE ENTREPRENEURIAL PROCESS	At the end of this unit Student should be able to <ul style="list-style-type: none">• Understand Meaning and importance of entrepreneurship• Understand the Motivations and reasons to start business• Clarity of knowledge Entrepreneurial process• Understand Entrepreneurship framework.	Introduction, entrepreneurship, Views on Entrepreneurship, Definitions of Entrepreneurship, historical perspectives on entrepreneurship, motivations to start a business, skill requirement, Difference between an Entrepreneur and a Manager, different types of entrepreneurs, an entrepreneur converts the demand into supply, values and entrepreneurship, areas of skill development for entrepreneurs.	6	8
UNIT-II	ENTREPRENEURSHIP FRAMEWORK AND THE ENTREPRENEURIAL PERSONALITY	At the end of this unit Student should be able to <ul style="list-style-type: none">• Understand Role of information in opportunity recognition• Knowledge of Emergence of entrepreneurship• Understand Entrepreneurship framework• Clarity of knowledge Entrepreneurial personality.	Introduction, opportunity factors, three ways to identify an opportunity, opportunity recognition process, factors impacting emergence of entrepreneurship, entrepreneurial framework, framework of entrepreneurship, mental sequences in idea development, entrepreneurial development - four major themes, fourteen character traits of an entrepreneur.	8	12
UNIT-III	START-UP FACTORS,	At the end of this unit Student should be able	Starting the venture, creativity, from	6	10

	ORGANISATIONAL PLANNING AND WOMEN ENTREPRENEURSHIP	<p>to</p> <ul style="list-style-type: none"> • Understand Meaning and importance of start-up factors of entrepreneurship • Understand Entry barriers • Understand Significance and associated details of new ventures • Factual & Theoretical Knowledge of Organizational planning 	creativity to entrepreneurship, environment scanning, swot (strengths, weaknesses, opportunities and threats), competitor analysis, industry analysis, porter's five forces analysis, feasibility studies, market analysis, business plan, preparing project report, , the marketing concept for entrepreneurs, the marketing system, organization plan		
UNIT-IV	ORGANISATIONAL STRUCTURE AND FORMS OF OWNERSHIP	<p>At the end of this unit Student should be able to</p> <ul style="list-style-type: none"> • Understand Meaning and importance of various organizational structures in new ventures • Understand the perspective of entrepreneurship • Activity Forms of ownership 	Basic forms of ownership, organizational structure, job design, meaning and importance of manpower planning, financial planning, cash budget, working capital, Performa income statement, Performa balance sheet, break even analysis	8	12
UNIT-V	STAGES OF GROWTH AND STRATEGIC MANAGEMENT PROCESS	<p>At the end of this unit Student should be able to:</p> <ul style="list-style-type: none"> • Understand the Stages of growth of entrepreneurial ventures • Understand Barriers to growth • Knowledge of Entrepreneurship in small firms • Understand Strategic management process 	Five stages of growth and development, grainer's model of organizational growth, business model, Definitions of the Term "Business Model", business model process, importance of the business model, the life cycle of entrepreneurship, barriers to small firm growth, strategic factors of entrepreneurship in small firms	6	10
UNIT-VI	INTELLECTUAL PROPERTY CONCEPT AND INNOVATION	<p>At the end of this unit Student should be able to</p> <ul style="list-style-type: none"> • Understand Concept of intellectual property • Understand Role perspective of intellectual property concept in entrepreneurship • Knowledge of IP rights as strategic tools in entrepreneurship • Understand to Innovational important tool for entrepreneurship 	Concept of property, intellectual property, objectives of intellectual property, nature of intellectual property rights, source of intellectual property, intellectual property and economic development, types of intellectual property, criteria for patentability, some exclusion from patentability, special requirement for patent, trademarks, trade names & services marks	6	8

Learning Resources:

Reference Books:

SR. NUMBER	AUTHOR	TITLE	PUBLISHER
1	DHOTRE	CNC MACHINE TOOL TECH. WITH PROGRAMMONG & OPERATING	SAITECH
2	B. S. PABLA	CNC MACHINES	NEW AGE PUBLICATION
3	DAVID GIBBS	CNC MACHINES & PROGRAMMING	INDUSTRIAL PRESS. INC.
4	S. N. MAHAJAN	METROLOGY & QUALITY CONTROL	NIRALI PUBLICATION
5	M. MAHAJAN	METROLOGY	DHANPAT RAI &CO.
6	NALINAKSHA MUTSUDDI	YOU TOO CAN BECOME AN ENTERPRENEUR	WHEELER PUBLISHING
7	B. S. RATHORE	A HANDBOOK OF ENTERPRENEURSHIP	AAPGA PUBLICATIONS
8	B. M. NAIK	EDUCATION & LEADERSHIP	ATLANTIC
9	V. D. KODGIRE	MATERIAL SCIENCE & METALLURGY	EVEREST PUBLISHING HOUSE
10	P. H. JOSHI	PRESS TOOL DESIGN & CONSTRUCTION	S. CHAND
11	R. G. W. PYE	INJECTION MOULD DESIGN	EWP
12	JOSHI	JIGS & FIXTURES	MC GRAW HILL EDUCATION
13	V. K. KHANNA	TQM	NEW AGE PUBLICATIONS
14	P. K. ROY	CUTTING TOOL TECHNOLOGY	NIRALI PUBLICATIONS
15	G. R. NAGPAL	TOOL ENGINEERING & DESIGN	KHANNA PUBLICATION
16	PROF. L. C. JHAMB	PRODUCTION PLANNING & CONTROL	EVEREST PUBLISHING HOUSE
17	P. C. SHARMA	PRODUCTION ENGINEERING	S. CHAND
18	PROF. SHAM TICKOO	AUTOCAD 2012 FOR ENGINEERS & DESIGNERS	DREAMTECH PRESS
19	PROF. SHAM TICKOO	SOLIDWORKS 2014 FOR ENGINEERS & DESIGNERS	DREAMTECH PRESS
20	JAMES VALENTINO	LEARNING MASTER CAM X MILLING 2D	INDUSTRIAL PRESS

