POST DIPLOMA IN CAD/CAM (PDCC)

curriculum

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

SEMESTER: I

COURSE NAME: Engineering Drawing

COURSE CODE: ED/01

COURSE OUTCOMES:

- After completion of course Student should be able to:
- Explain the application of engineering drawing.
- Construct different Geometrical figures using drawing Instruments.
- Construct orthographic Projections giving proper dimensioning with title block using appropriate line type and scale for any geometrical figure.
- Draw Free hand sketches of machine parts with correct proportions

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

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	PR hours	Marks	
UNIT-I	Introduction to Engineering Drawing	After completion of unit Student should be able to • Explain applications and advantages of Engineering Drawing • Understand and explain difference between Drawing and Engineering Drawing • Demonstrate and explain various Drawing instruments • Calculate Representative • Understand and demonstrate method of dimensioning	Introduction and importance of engineering drawing, difference between Drawing and Technical drawing, Drawing Instruments - their Standard and uses, types of pencils used in technical Drawing, Lines, Drawing of Geometrical Figures , Lettering and Numbering, Dimensioning , Free hand drawing, sizes and Layout of Drawing Sheets, Method of presentation, Symbolic Representation	10	10	
UNIT-II	Projections and plane:	After completion of unit Student should be able to • Understand and explain the concept and importance of Plane and projection • Understand between first and third angle of projection • Use appropriate symbol in engineering drawing	Introduction to projections and planes, types of projection, difference between first angle projection and third angle of projections, types of plane, symbols used in angle of projection, practical examples on plane and projections.	10	10	
UNIT-III	Orthographic Projections:	After completion of unit Student should be able to • Draw geometrical figures • Read and understand	Introduction to orthographic Projection, Construction of Geometrical Figures, Drawing of Solid figures, Drawing of Orthographic projection of blocks, Orthographic Drawing of simple	10	10	

				10	10	
		engineering drawing of any components / Parts • Identifies the drawing with different angle of projection with respect to different views	fastener, practical examples of different component drawing in different angles of projection, drawing the projection of Points, line and solids in different views			
UNIT-IV	Units & Dimensioning.	After completion of unit Student should be able to • Understand and use of dimensioning systems • Understand the conversion of units in different standards • Understand and application of limit, fit and tolerances.	Introduction to units, Dimension and tolerance, Limit, Fit, types of fit, geometrical tolerance symbols and characteristics, surface texture symbols, Surface texture value & location	10	10	

SEMESTER: I

COURSE NAME: CNC PART PROGRAMMING

COURSE CODE: CPP/01

COURSE OUTCOMES:

After completion of course Student should be able to:

- Explain applications and advantages of CNC machines and technology
- Demonstrate and explain various CNC control , calculate technological data for CNC machining
- Prepare and understand line program for various profile
- Identify and set parameters for various simulators
- Prepare programs , demonstrate , simulate and operate CNC lathe machines for various machining operations
- Prepare programs , demonstrate , simulate and operate CNC milling machines for various machining operations
- Understand and write Part program for CNC
- Understand computer aided part programming

- Prepare programs , demonstrate , simulate and Execute various operation of machines for various machining operations

THEORY HOURS: 40   PRACTICAL HOURS: 80   THEORY MARKS: -20   PRACTICAL MARKS: 40

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	Hours	Marks	
UNIT-I	Introduction to CNC technology	After completion of unit Student should be able to • Explain applications and advantages of CNC machines and technology • Understand and explain difference between conventional & non-conventional machine tool • Demonstrate and explain various CNC control • Calculate technological data for CNC machining • Explain the JH system, its use and application • 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, CNC clamping system, CNC programming basics, Introduction to manual NC programming, manual NC programming for lathe & milling machines, application of Numerical Control, Advantages, & Disadvantages, Adoptive Control System. Practical training & workshop for above sub topics on CNC Machine.	20	10	
UNIT-II	CNC Programming	After completion of unit Student should be able to • Understand and explain the concept and importance of CNC programming • Prepare and understand line program for various	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	30	15	

		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 • Analyze parameters for various machining cycles and operations	planning issues and path planning, G & M Codes, Interpolations, Canned Cycles and Subprograms, Tool compensations, exposure for programming and simulator of FANUC, SINUMERIC, Machining of programmed exercise on CNC lathe & milling machines.		
UNIT-III	Part Programming	After completion of unit Student should be able to • Understand and write part program for CNC • Optimize parameters for various operations • understand elements of part programming • understand dimensioning system used in part programming • Simulate, and perform various CNC operations	Introduction, Types of Programming, Manual part programming, fundamentals elements of manual part programming, Type of Dimensioning System, Incremental System, absolute system, axis designation, NC words, rapid positioning, linear interpolation, circular interpolation, symbols used, Spindle Function, Feed Function, Tool Function, works Settings and Offsets art programming for CNC milling, program practices, and exercise based up on different geometrical shapes, plan and optimize programs for CNC operations, calculate parameters like speed feed etc. and set a references for the various operations	40	20
UNIT-IV	Computer Aided Part Programming	After completion of unit Student should be able to • Define Computer aided part programming. • Understand Pocket Optimization Module. • Generate part prom	Introduction to part Programming, computer integrated and optimized system for milling operations , fixed cycle/canned cycle, do-loops, Pocket optimization module I/O interfaces, Part program generation through CAM software like: Pro-E, DelCAM, Master CAM, NX-CAM, Work-NC, Post Processors Computations for part	30	15

		through CAM software. • Write and execute part program for complex geometrical shape. • operations	programming.			

SEMESTER: I

COURSE NAME: Computer Fundamentals and Auto Cad

COURSE CODE: CF & ACD/01

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

- Describe the parts of a computer system
- Describe the use of different types of Graphics software
- Differentiate between primary and secondary memory
- Differentiate between system software and application software
- Identify hardware components of computer
- Understand types of different CAD/CAM/CAE software.
- Create 2D geometric sketches by using Auto CAD software.

THEORY HOURS: PRACTICAL HOURS: 140   THEORY MARKS: PRACTICAL MARKS: 70

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	PR hours	Marks	
UNIT-I	Fundamentals of computer	At the end of this Unit the student should be able to: • Demonstrate the use of computer peripherals, Manage files & folders and installation of different software • Understand and demonstrate the various I/O devices of computer • Understand the use of computer system. • Understand the architecture of computer • Understand various types of system software.	Generations of Computer, Functions of the Different Units, input & Output Devices, Cache Memory, Primary Memory, Secondary Memories, System Software, Application Software, Software hierarchy and dependence between the different layers.	20	10	
UNIT-II	Introduction and creation of 2D drawings	At the end of this Unit the student should be able to: • Understand Uses and Importance of CAD software in Industries. • Understand the application of Auto CAD software. • Understand and demonstrate 2 D drawing with Auto CAD. • Create various types of sketch geometry. • Understand editing property tools.	Introduction to Auto CAD, Graphics Screen of Auto CAD, Menu Area Setup for drawing, Creation of 2D Drawings: Point, Line, construction line, multiline, polyline, ray, arcs, circle, rectangle, polygons, ellipse, spline, Text, application of layers, create and open a new file, etc.	40	20	
UNIT-III	Modification , Dimensioning and tolerances	At the end of this Unit the student should be able to: • Modifies the drawing as per the requirement • Understand the use of Geometric dimensions & tolerances	Modification of 2D Drawing: Fillet, chamfer, trim, mirror, scaling, stretch, copy, move, offset, array, lengthen, extend, break, join, etc., discussion on Dimensions, Geometrical Dimension, Tolerance method in Auto CAD, concept of Isometric Drawing, Layout &	40	20	

		• Understand Concept of Isometric Drawing, Layout & Plotting. • Understand the creation of basic solid modeling / 3d modeling.	Plotting. Creating of basics solid modeling / 3d modelling. Like creating, Editing, and modification technique.				
UNIT-IV	3 D editing and creation of object drawings	At the end of this Unit the student should be able to: • Understand and use of 3D Editing in Auto CAD. • Understand drawing generation with dimensioning & detailing. • Create Solid Modeling and Feature Based Part Modeling. • Understand Assembly- Constraint based Parametric Profile Editing and 3D Constraint Solver.	Editing 3D Drawings: Union, intersect, subtract, extrude faces, rotate faces, offset faces, delete faces, move faces, imprint, shell, etc., assign different colors to different types of object, generation of orthographic & isometric views for a 3D component with different scales and Creation of 2D drawing & 3D Objects.	40	20		

SEMESTER: I
COURSE NAME: SOLIDWORKS

COURSE CODE: SW/01

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

- Understand the basic Solid Works Design process and concepts.
- Understand the application of Solid works software and compare it with different CAD software
- Create 2D geometric sketches by using Solidworks software.
- Use parametric modeling techniques to reflect engineering requirements
- Develop 3D solid & surface modeling by using various commands of NX.
- Understand assembly constraint & develop different types of assembly design.
- Apply knowledge in create complicated modeling & creative/innovative solution.
- Communicate effectively the geometry and intent of design features.

THEORY HOURS: PRACTICAL HOURS: 160   THEORY MARKS: PRACTICAL MARKS: 80

Unit Name	Unit Name	Unit level outcomes	Contents (chapters/topics)	PR hours	Marks	
UNIT-I	Introduction to Solidworks and 2D Sketching	At the end of this Unit the student should be able to: • Understand and use of Solidworks software • Understand area of application whereSolidworks can be applied • Will be able to differentiate the features of different software with Solidworks. • Create sketch with Solidworks software	Introduction to Solidworks, Area of application & advantages of Solidworks, 2D Sketch which include Line, circle ,arc, ellipse, parabola, conic, circular, chamfer, spline, point, coordinate system, convert entities, dimensioning & modify, text, palette, divide, delete segments, mirror, rotate & scale, their uses and Practices.	40	20	
UNIT-II	Part Modeling	At the end of this Unit the student should be able to: • Understand the concepts of creating part module • Create part models of a component/Part • Create 3D parametric models from simple 2D drawings • Understand and implement various materials assignments • Understand Adding Geometric & Dimensional Constraint to sketches.	Part modeling fundamentals, Steps to create a parametric solid model, creating a constrained sketch and profile Planes & sketch origin Color code sketching Primary Feature: Extrude Bose/Base, Revolve, Swept Loft, and their cut features, their uses, practices. Secondary Features: Fillet, Chamfer, Hole Wizard, Type of Patterns, Drafts, Shell, Mirror, Dome and their uses, Practices. 3D Solid Modeling: Freeform, Deform, Indent, Flex Wrap, their uses and practices. Surface Modeling: Extrude Revolve, Swept, Loft, Boundary Surface, Fillet	40	20	

			Surfaces, Freeform, Planar Surface, Offset, Ruled Surface, Delete and Replace Face, Extend Surface, Trim and Untrim Surfaces, Thicken and Thicken Cut and their practices.			
UNIT-III	Assembly, Drafting and Annotate	At the end of this Unit the student should be able to: • Understand the concepts of performing assembly drawing • Understand concept of assembly constraint. • Understand concept of Drafting. • Understand different types of view. • Understand Working with Datum plane, Coordinate System, and datum axes.	Assembly: Various types of mate including standard, advance and mechanical mates, types of pattern, smart fastners, move and rotate component, assembly feature, reference geometry, exploded view, motion study and their uses, practices. Drafting: View Layouts: Standard 3 view, models, projected, auxiliary, section and detail view break view, broken out section, crop view, alternate position view and their uses, practices. Annotate: Various types of dimensioning, model items, spell check, notes, surfaces and weld symbols, hole callout, geometric tolerances, datum features and target, block, center and center line marks, all types of table including- general table, hole table, bill of material and revision table, their uses and practices.	40	20	
UNIT-IV	Manufacturing function and Evaluation of	At the end of this Unit the student should be able to: • Understand and use of	References Geometry & Curves and their uses, practices. Sheet Metal: Base Flange/Tab, Edge and Mitter	40	20	

| | drawing | Reference Geometry and curve
• Understand the concepts of mold, weld met, sheet metal associated with solid works software
• Evaluate the drawing | Flange, Hem, Jog, Sketch Bend, Corner and Welded Corner, Extruded Cut, Simple Hole, Vent, Unfold, Fold, Flatter, No Bend, Rip, Insert Bend, Loft Bend and Forming Tool.

Mold: Parting Line, Parting Surfaces, Shut-off Surfaces, Tooling Split, Core and Cavity, Combine, Split, Move/Copy, Delete Body and their uses, practices.

Weldment: 3D Sketch, Structural member, Trim, Extend, Extrude Bose/Base, End Cap, Gusset, Fillet Bead, Extruded Cut, Hole Wizard, Chamfer, Reference Geometry and their uses, practices, Evaluate: Mass, Mass and Section properties, Statistics, Check, Import, Diagnostics, Zebra Strips, Curvature, Draft analysis, and their uses, practices. | | | |

SEMESTER: I

COURSE NAME: PRO-Engineer

COURSE CODE: Pro-e/01

COURSE OUTCOMES:

- Able to Analyze and understand customers need
- Able to Discuss and finalize product needs
- Prepare Conceptual design and finalize
- Test against standards and parameters
- develop 2D and 3D model using CAD software
- interpret of output
- apply CAD in Tool Design

THEORY HOURS: PRACTICAL HOURS: 160   THEORY MARKS: PRACTICAL MARKS: 80

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	PR hours	Marks	
UNIT-I	Introduction to Pro-Engineer	At the end of this Unit the student should be able to: • Understand advance computer aided design. • Understand various workbenches & able to Pro-e user interface. • Have Knowledge in various commands & various visualization. • Differentiate various CAD software to Pro-e.	Introduction to pro-e& various workbenches, Pro e user interface, Tool Bar Customization, Various Visualization commands.	20	10	
UNIT-II	2D sketching and 3D Elements	At the end of this Unit the student should be able to: • Have knowledge in sketching interface. • Understand various sketch profile tool. • Have Knowledge various modification tools. • Create complicated geometry sketch • Understand & Use Project 3D Elements, Intersect 3D Elements, Isolate sketch profile	Sketching in pro e, 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.	30	15	
UNIT-III	Part Modelling	At the end of this Unit the student should be able to: • Understand 3D Modeling concept. • Use various workbench based feature. • Create 3D model design. • Illustrate advanced Transformation features. • Use and create Surface Based	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.	50	25	

		Features.				
UNIT-IV	Surface Modeling	At the end of this Unit the student should be able to: • Execute various surface creation methods. • Understand & apply Operation tools. • Understand advanced commands. • Create surface model. • Perform advanced solid & surface modeling	Tweak features. Various surface creation methods method extrude, revolve, offset, swept, loft. Operation on shape geometry join, healing, trim, extract geometry projects. Advanced commands e.g. bend solid, toroid bend etc.	30	15	
UNIT-V	Part Assembly	At the end of this Unit the student should be able to: • Understand concept of assembly constraint. • Understand difference between bottom up and Top down assembly. • To develop Assembly model. • Create Bill of material.	Various Assembly constraints. Working with bottom up and top down assembly. Design in context. Generating bill of material. Tool Develop & design in Pro-e.	20	10	
UNIT-VI	Drafting	At the end of this Unit the student should be able to: • Understand concept of Drafting. • Understand different types of view. • Use different engineering symbols.	Creating various views through wizard. Creating various section views. Add a B.O.M. Adding text and labels. Dimensioning, Various engineering symbols, Translators. Tool Develop & design in Pro-e.	10	5	

SEMESTER: I

COURSE NAME: Finite Element Analysis (FEA)

COURSE CODE: FEA/01

COURSE OUTCOMES:

After completion of course Student should be able to

- Analyze and understand the mechanical property of the component
- understand the concept & principle of commuter aided Engineering (CAE).
- Prepare Conceptual design and finalise
- Test against standards and parameters
- Analyze using CAE software

THEORY HOURS: 30   PRACTICAL HOURS: 60   THEORY MARKS: 15   PRACTICAL MARKS: 30

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	Hrs.	Marks	
UNIT-I	Introduction to FEA and CAE	At the end of this unit student should be able to • Understand Finite element method. • Work with CAE software • Describe stress strain relationship • solve static Analysis	Introduction to Finite Element Method, Mechanical, Boundary conditions. Strain-Displacement relations. Stress-strain relations. One Dimensional Problem: Finite element modeling. Local, natural and global coordinates and shape functions. Quadratic shape functions, application of static Analysis with CAE Workbench Mechanical.	30	15	
UNIT-II	Application of CAE in Engineering Problem	At the end of this unit student should be able to • Understand the axial stress on trusses and frame • To apply proper remote boundary conditions • Knowledge of post processing • Evaluate the results of solution	Analysis of trusses and frames: Analysis of plane truss with number of unknowns not exceeding two at each node. Analysis of frames with two translations and a rotational degree of freedom at each node. Analysis of Beams: Element stiffness matrix for two nodded, two degrees of freedom per node for beam element.	20	10	
UNIT-III	Finite Element Modeling	At the end of this unit student should be able to • To use of finite element modeling with ANSYS Workbench Mechanical • Apply boundary conditions in ANSYS Workbench Mechanical • Results reading • Optimization of analysis	Finite element modeling of two dimensional stress analysis problems with constant strain triangles and treatment of boundary conditions. Finite element modeling of Axisymmetric solids subjected of axisymmetric loading with triangular elements. Convergence requirements and geometric isotropy To Subjected To Design Optimization And Parametric Of Post processing Result Of ANSYS Workbench Mechanical	20	10	

| UNIT-IV | Heat Transfer Analysis | At the end of this unit student should be able to To have Fundamental knowledge of NON-LINER To understand thermal behavior To describe conduction, convection & radiation. To use 1D & 2D element of thermal | Steady state heat transfer analysis: One dimensional analysis of a fin and two dimensional conduction analysis of thin plate. Using the NON-LINER solver to solve the Complex problem in ANSYS Workbench Mechanical Dynamic analysis: Formulation of finite element modeling of Eigen value problem for a stepped bar and beam. Evaluation of Eigen values and Eigen vectors. | 20 | 10 | |

SEMESTER: I

COURSE NAME: REVERSE ENGINEERING

COURSE CODE: RE/01

COURSE OUTCOMES:

After completion of course Student should be able to

- understand and explain basic concept of Reverse Engineering techniques
- Classify different techniques of reverse engineering
- Describe advantage and disadvantages of Reverse Engineering
- Understand about the rapid prototyping and rapid tooling
- Apply knowledge of Reverse Engineering in product design stage.

THEORY HOURS: 50   PRACTICAL HOURS: THEORY MARKS: 25   PRACTICAL MARKS:

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH Hrs.	Marks	
UNIT-I	Introduction and Basics of Reverse Engineering	At the end of this unit student should be able to • Understand the basic concept of Reverse Engineering • To understand the design potential in 3D Printing • To have knowledge rapid prototyping and tooling • To describe design complexity	Introduction and definition of Reverse Engineering, concept of rapid prototyping, application of reverse engineering and rapid prototyping, 3D printer, Additive manufacturing,	10	5	
UNIT-II	CAD and rapid manufacturing	At the end of this unit student should be able to • To apply basic CAD properties • To test the functional of 3D scanning & 3D printing • Use the 3D scanning to reconstruct the design • To get the dimensions over physical modal	CAD and Rapid manufacturing, 3D scanning tools, CAD background, 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.	20	10	
UNIT-III	Requirement of Rapid Manufacturing	At the end of this unit student should be able to • To have basic knowledge of materials • To use the concept of photo polymerization • Apply the processes control of 3D printing	Material issue in rapid manufacturing. Role of materials in rapid manufacturing, viscous flow, photo polymerization, sintering, infiltration and materials for RM parts. Materials and processes control for rapid manufacture.	10	5	
UNIT-IV	Economics of reverse	At the end of this unit student should be able to	Production economics of rapid prototyping, economics of 3D scanning, Stereo lithography,	10	5	

| | Engineering and Rapid manufacturing | • 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 3D printing process & technology | selective laser sintering, fused deposition modeling, and metal based processes. Machine cost material cost, labor cost. | | | |

SEMESTER: I
COURSE NAME: WORK NC

COURSE CODE: WNC/01

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

- Understand and use of Work NC software.
- Create 2D geometric sketches by using work NC software.
- Develop 3D solid & surface modeling by using advanced command.
- Understand NC code generation with Work NC software for CNC machine.
- Understand And perform CAM with Work NC

THEORY HOURS: PRACTICAL HOURS: 100   THEORY MARKS: PRACTICAL MARKS: 50

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	PR Hours	Marks	

UNIT-I	Introduction to WORK NC and Sketcher	At the end of this Unit the student should be able to: • Understand and use of work NC software • Understand area of application where work NC can be applied • Will be able to differentiate the features of different software with Work NC. • Create sketch with work NC software	Introduction to Work NC & Sketch toolbar includes: points, lines, polylines, circles, arcs, ellipse, texts, hatch, fillets, chamfers, Dimension toolbar include various methods of dimensioning	20	10	
UNIT-II	Transformation and Work zone	At the end of this Unit the student should be able to: • Understand the transformation concepts • Create sketch for solid models • Create complicated geometry sketch • Understand application of transformation. • Understand and perform 2D and 3d Transformation of any curves • Understand the concept of work Zone.	Transform: Adjust Curves: smart delete, extend, trims, breaks, divides, merge curves, stretch, modify curves, clean curves, convert into arc/line, adjust nurbs curves Trim/Untrm surfaces: cutter, cut by active plane, surfaces single & multiple groups, trim at part line, remove cut, untrim all, partial untrim. Project Curves: Smash curve on active grid, project curve on surfaces, extract/project curves of surfaces, Move & Copy include: translate, 2d rotate, 3d rotate, 2d mirror, 3d mirror, align, move align UCS, matrix, 3d matrix, helix, Boolean, convert, non linear, explode & STL : union, intersect, difference, curves to nurbs curve & surface to nurbs surface, deform curve, blend & twist nurbs curve/surfaces, simplify & trim STL Work Zone : Geometries, optional surfaces, stock initialization	40	20	
UNIT-III	Work NC- CAM	At the end of this Unit the student should be able to:	Work NC CAM include following operations: 2D axis Toolpath: Pocketing, facing, tangent	40	20	

		• Understand the concepts of performing CAM Operation • Understand concept of creating tool path for CAM. • Understand concept of Drafting. • Perform optimization activities with work NC cam. • Understand about the contouring and finishing.	to curve, rib machining, on curve engraving, drilling & boring, 3-Axis Roughing: global rough/rerough, flat surface rough/rerough. 3-Axis Finishing :Finishing operations include: Z-level finishing, planar finishing, flat surface & 3d drive curve finishing, Optimization: Z-level & planar finishing Remachining: Z-level,planar & contour remachining, Contouring: 3D contour & parallel pencil trace		
UNIT-IV	Job setup and NC Programing	At the end of this Unit the student should be able to: • Understand job setup techniques • Understand the NC programming of work NC • Understand and use of NC code • Differentiate work NC cam with other CAM softwares.	Job Setup, Requirement of job setup, machine specification, NC programming and Post processing	20	10

SEMESTER: II

COURSE NAME: Master CAM

COURSE CODE: MCAM/02

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

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

THEORY HOURS: PRACTICAL HOURS: 160   THEORY MARKS: `   PRACTICAL MARKS: 80

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	PR hours	Marks	
UNIT-I	Introduction to MASTER CAM	At the end of this Unit the student should be able to: • Understand about the working of CNC Machines • Understand capabilities of MASTER CAM Software • Understand scope and application area of CAM software. • Understand difference between CAM/CAD/CAE software. • Analyze various CAM software compare to Master CAM	Introduction: Introduction to CNC Machines, Introduction to MASTERCAM, Product Introduction, Basic concepts of CAM (cutters, machines job setup, etc), Creating 2D drawings, 2D tool paths, 3D models(Solid & Surface), 3D tool.	40	20	
UNIT-II	Creating and Modification of 2D Drawings	At the end of this Unit the student should be able to: • Understand Master CAM Environment • Create basic geometry. • Execute editing, modification, creating features. • Understand brief Transformation feature. • Use and Understand modify tool.	Introduction to master CAM environment, 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 l 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. Transformation of object - Mirror, Rotate, Translate, Scale.			
UNIT-III	Introduction to solid modules and 2D Tool paths	At the end of this Unit the student should be able to: • Understand 2D tool path generation. • Understand concept of CNC machining. • Perform & generate various milling & Lathe operations. • Understand Post processing.	Extrude, Revolve, Fillet, Chamfer, Sweep, Thicken, Ruled, Boolean operations (Add, Subtract, Common), Converting Solid to Surface , Surface to Solid 2D Tool path generation, concepts of Machining, CNC control basics, & coordinate systems, Selection of tool, tool parameters, Program Manager /	40	20	

				40	20	
		• Understand NC program Transfer to CNC machine.	Creation of 2D tool path: contour / Facing / Pocket. Compensations, Drilling parameters Pocket, Contour, Facing, Drilling, Transforming, Back plot, Verification, post processing, Plane concepts.			
UNIT-IV	Introduction to 3D Tool Path and wireframe Modelling	At the end of this Unit the student should be able to: • Understand 2D tool path generation. • 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.	Boundary box, Orientation, Analyzing, Pocket, Contour, Shallow, Parallel, Rest milling, Corner finishing tool paths, Back plot, Verification, Gouge checking, Post processing, Editing of programs, Wireframe Modeling: 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.	40	20	

SEMESTER: II

COURSE NAME: Unigraphics -NX

COURSE CODE: NX/02

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

- Understand the application of NX software and compare it with different CAD softwares
- Create 2D geometric sketches by using NX software.
- Develop 3D solid & surface modeling by using various commands of NX.
- Understand assembly constraint & develop different types of assembly design.
- Apply knowledge in create complicated modeling & creative/innovative solution.

THEORY HOURS: PRACTICAL HOURS: 160   THEORY MARKS: PRACTICAL MARKS: 80

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	PR hours	Marks	
UNIT-I	Introduction to Unigraphics- NX & Sketcher	At the end of this Unit the student should be able to: • Understand and use of NX software • Understand area of application where NX can be applied • Will be able to differentiate the features of different software with NX. • Execute the concept of hardware & software. • Create sketch with NX software	Introduction to CAD/CAM Software, Introduction of Unigraphics. History of cad & UG. Technical terms related to UG, Scope of Unigraphics (NX), Required hardware & software, High end & low end software, various Sketch Commands include line, circle, arc, fillet, chamfer, offset etc., dimensioning & constraining, Capability of CAD Software and Introduction to Unigraphics, Geometric modeling, entities, 2D & 3D Primitives.	40	20	
UNIT-II	Solid & Surface Modelling	At the end of this Unit the student should be able to: • Create sketch for solid models • Create complicated geometry sketch • Understand Adding Geometric & Dimensional Constraint to sketches. • Understand & Create sketches in the Sketch task environment & Modeling Environment.	Drawing sketches for solid models, Creating sketches in the Sketch task environment & Modeling Environment, 3D modeling, Plane creation, 3D Curve , Extruding, Revolving, Part modification, Using history access, Surfacing, Shell, Fillet, Draft, Sweep & Through Curve, Free form feature and constraints.	40	20	
UNIT-III	Assembly and Drafting	At the end of this Unit the student should be able to: • Understand the concepts of performing assembly drawing • Understand concept of assembly constraint. • Understand concept of Drafting. • Understand different types of view.	Introducing assembly, Part constraining and B.O.M, Creating geometry and modifying geometry, Creating dimension and Constraining, Working with Datum plane, Coordinate System, and datum axes. Specifying Boolean operation, Advance Modeling Tool like creating various types of Hole, Grooves, Slots, Dove-Tail Slots, Chamfer, and Edge Blend. Pattern Feature	40	20	

		• Understand Working with Datum plane, Coordinate System, and datum axes.	Tool, Mirror Feature Tool, and Sweeping Sketches along guide curve. Creating swept, Tubes or cables, Threads, Shell Features.			
UNIT-IV	NX CAM	At the end of this Unit the student should be able to: • Understand and use of NX-CAM • Generate NC code for CNC machione • Understand about the application of NX-CAM in industries.	Introduction to NX-CAM, Cavity milling, Facing, Roughing, Semi finishing, Finishing, Z-level, Fixed contour, Job setup, NC program, Post processing	40	20	

SEMESTER: II

COURSE NAME: ENTREPRENEURSHIP AND MANAGERIAL SKILLS

COURSE CODE: E&M/02

COURSE OUTCOMES:

- After completion of course Student should be able to
- Understand the basic qualities of an entrepreneur
- Understand the process of becoming an entrepreneur
- Understand and apply the managerial skills.
- 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.

THEORY HOURS: 60   PRACTICAL HOURS: THEORY MARKS: 30   PRACTICAL 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 • Meaning and importance of entrepreneurship • Motivations and reasons to start business • Entrepreneurial process • Entrepreurship framework.	Introduction and Definitions of Entrepreneurship, historical perspectives on entrepreneurship, motivations to start a business, skill requirement, Entrepreneurial Qualities, Difference between an Entrepreneur and a Manager, different types of entrepreneurs, an entrepreneur converts the demand into supply, role of attitude, values and entrepreneurship.	15	7.5	
UNIT-II	ENTREPRENEURSHIP FRAMEWORK AND THE ENTREPRENEURIAL PERSONALITY	At the end of this unit Student should be able to understand • Role of information in opportunity recognition • Emergence of entrepreneurship • Entrepreneurship framework • Entrepreneurial personality.	Introduction, opportunity recognition, 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, the entrepreneurial personality, personality traits, fourteen character traits of an entrepreneur, competitive advantages of an entrepreneurial frim, difference between self-employment and entrepreneurship, entrepreneurial competencies, entrepreneurial women,	15	7.5	
UNIT-III	START-UP FACTORS,	At the end of this unit Student should be able to Understand	Starting the venture, creativity, from creativity to entrepreneurship,	15	7.5	

	ORGANISATIONAL PLANNING AND WOMEN ENTREPRENEURSHIP	• Meaning and importance of start-up factors of entrepreneurship • Entry barriers • Significance and associated details of new ventures • Organizational planning • Women entrepreneurship	environment scanning, swot (strengths, weaknesses, opportunities and threats), competitor analysis, marketing plan, marketing research for the new venture, the marketing concept for entrepreneurs, the marketing system, organization plan, barriers to entrepreneurship, women entrepreneurship.			
UNIT-IV	ORGANISATIONAL STRUCTURE AND FORMS OF OWNERSHIP	At the end of this unit Student should be able to understand • Meaning and importance of various organizational structures in new ventures • Through the perspective of entrepreneurship • Forms of ownership • Job design and Financial planning • Budgeting	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, sick industries, board for industrial and financial reconstruction,	15	7.5	

SEMESTER: II
COURSE NAME: CATIA

COURSE CODE: CAT/02

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

- Understand Computer aided design software Catia as compare to other CAD software.
- Create 2D geometric sketches by using 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: 160   THEORY MARKS: PRACTICAL MARKS: 60

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	PR Hours	Marks	
UNIT-I	Introduction to CATIA Sketcher	At the end of this Unit the student should be able to: • Understand and use of CATIA software • Understand area of application where CATIA can be applied • Will be able to differentiate the features of different software with CATIA. • Execute the concept of hardware & software. • Create sketch with CATIA software	Introduction to CAD/CAM Software, Introduction of CATIA. History of cad & CATIA. Technical terms related to CATIA, Scope of CATIA, Required hardware & software, various Sketch Commands include line, circle, arc, fillet, chamfer, offset etc., dimensioning & constraining, Capability of CAD Software and Introduction to salient features of CATIA, Advantages of CATIA .	40	20	
UNIT-II	Solid & Surface Modelling	At the end of this Unit the student should be able to: • Create sketch for solid models • Create complicated geometry sketch • Understand Adding Geometric & Dimensional Constraint to sketches. • Understand & Create sketches in the Sketch task environment & Modeling Environment.	Drawing sketches for solid models, Creating sketches in the Sketch task environment & Modeling Environment, 3D modeling, Plane creation, 3D Curve , Extruding, Revolving, Part modification, Using history access, Surfacing, Shell, Fillet, Draft, Sweep & Through Curve, Free form feature and constraints.	40	20	
UNIT-III	Assembly and Drafting	At the end of this Unit the student should be able to: • Understand the concepts of performing assembly drawing • Understand concept of assembly constraint. • Understand concept of Drafting. • Understand different types of view.	Introducing assembly, Part constraining and B.O.M, Creating geometry and modifying geometry, Creating dimension and Constraining, Working with Datum plane, Coordinate System, and datum axes. Specifying Boolean operation, Advance Modeling Tool like creating various types of Hole, Grooves, Slots, Dove-Tail Slots, Chamfer, and Edge Blend. Pattern Feature	40	20	

		• Understand Working with Datum plane, Coordinate System, and datum axes.	Tool, Mirror Feature Tool, and Sweeping Sketches along guide curve. Creating swept, Tubes or cables, Threads, Shell Features.			
UNIT-IV	Sheet Metal, Mould Design and DMU Kinematics	At the end of this Unit the student should be able to: • Understand the sheet metal operation in CATIA • develop mold design with CATIA Software • Understand and use of core and cavity. • Understand the concept of DMU fittings and Kinematics	Sheet Metal: walls, swept walls include: flange, hem, tear drop, user flange, rolled wall and hopper, bending operation include: Bends, conical bend, bend from flat, point or curve mapping, unfold and fold, cutting operations include: cutout, circular cutout, holes, corner relief, corner, chamfer, Stampings operatios include: surface stamp, bead, curve stamp, flange cutout, louver, bridge, flanged hole, circular stamp, stiffening rib, dowel, user stamp, pattern types, mirror etc. Core and Cavity: Importing model, creating pulling direction, creating parting surface, Transferring elements, and wire frame tools and operation tools. Mould Tool Design: - How to create mould base components, Guiding Components, Locating components, Fixing components, Ejection components, Injection components, DMU fitting: - Sequence and actions, Simulation, animation and mechanism. DMU Kinematics: - How to create new mechanism, Different types of joints, Fixed part, How to use formulas, How to simulate, compile of simulation, Replay and How to replay mechanism program, Post processing	40	20	

SEMESTER: II

COURSE NAME: BASIC ENGINEERING CONCEPT

COURSE CODE: BEC/02

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

- Understand the concept of Engineering Mechanics
- Understand units and dimensions.
- Calculate Moment of inertia of different geometrical Figures.
- Understand mechanical behavior of steel.
- Understand the application of engineering materials in the industries.
- Understand the concept of production and plant layout
- Understand and Identifies the location for plant layout.

THEORY HOURS: 40   PRACTICAL HOURS: THEORY MARKS: 20   PRACTICAL MARKS:

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH Hours	Marks	
UNIT-I	Introduction to Engineering Mechanics	At the end of this Unit the student should be able to: • Understand basic engineering mechanics concept • Understand units and dimensions • Identify and convert different units as per the requirement • Defined and derived the equation of motion • Calculate Moment of inertia of different geometrical Figures.	UNITS AND DIMENSIONS: Fundamental and derived units in SI System, FORCE AND MOTION: Scalars and Vectors, Velocity & acceleration, Equations of motion, Newton's law of motion, Composition and resolution of forces, centripetal and centrifugal forces, Concept of friction and its application WORK, POWER AND ENERGY: Work and its Units, concept of Kinetic energy and potential energy Expressions ROTATIONAL AND SIMPLE HARMONIC MOTIONS: Definition of moment of inertia, Moment of inertia of different geometrical Figures.	10	5	
UNIT-II	Basics of Strength of Material	At the end of this Unit the student should be able to: • Define stress and strain. • Develop the relation between different moduli(E,G and K) • Understand and Draw stress strain curve for different materials. • Understand mechanical behavior of steel	Introduction: Stresses and strains, Concept of load, stresses V/s strain, Tensile compressive and shear stresses and strains, Concept of Elasticity, Elastic Limit and limit of proportionality. Hook's Law, Young Modulus of Elasticity. Nominal stress. Yield point, plastic stage, Ultimate strength and breaking stress, Percentage elongation, Proof stress and working stress, Factor of safety, Shear modulus. Strain, Proof resilience and modulus of resilience, Stresses due to gradual sudden Load.	10	5	

UNIT-III	Engineering Materials	At the end of this Unit the student should be able to: • Understand different Engineering Materials • Classify the engineering materials • Understand the property of engineering materials • Understand the application of engineering materials in the industries.	Introduction to engineering materials, Classification of materials, Thermal, chemical, electrical, mechanical properties of various materials, Selection criteria for use in industry.	10	5	
UNIT-IV	Production Technology	At the end of this Unit the student should be able to: • Understand the concept of production and plant layout • Understand and establish Standard time for the process. • Understand and identifies the location for plant layout.	Introduction to manufacturing and production, Work Study, Method study Work measurement & TIme study, Plant Layout and Material Handling concept of plant layout Types of layout (Process, Product and Combination type Factors affecting plant location , Production Planning and Control Types of production : Job, batch and mass production, Inspection and Quality Control , Concept of TQM.	10	5	

SEMESTER: II

COURSE NAME: SAFETY AND MAINTANANCE

COURSE CODE: S&M/02

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

- Understand the organizational health and safety principles.
- Understand the use of safety equipment.
- Understand the use of personal protective equipment
- Understand the use of fire extinguishers
- Understand the techniques of waste disposal
- Understand the basic maintenance of equipment.

THEORY HOURS: 40   PRACTICAL HOURS: THEORY MARKS: 20   PRACTICAL MARKS:

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH Hours	Marks	

UNIT-I	Introduction to Occupational health and safety	At the end of this Unit the student should be able to: • Understand about safety rules • Understand the use of first aid and safety equipment • Understand the importance of occupational health and safety • Understand the environment guidelines	Health & Safety: Introduction to safety equipments and their uses, Introduction of first aid, operation of Electrical mains, Occupational Safety & Health, Importance of housekeeping & good shop floor practices. Health, Safety and Environment guidelines, legislations& regulations as applicable	15	7.5	
UNIT-II	Disposal procedure and PPE	At the end of this Unit the student should be able to: • Understand the Waste disposal techniques • Understand the use of PPE	Disposal procedure, Disposal of waste materials like cotton waste, metal chips/burrs etc, personal protective Equipments (PPE): Basic injury prevention, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message.	15	7.5	
UNIT-III	Preventive measures and Maintenance	At the end of this Unit the student should be able to: • Understand the concepts of Maintenance • Understand concept of preventive measures. • Understand different types of maintenance. • Understand about the electrical accidents.	Definition of maintenance, types of maintenance, maintenance philosophy, Preventive measures, Electrical accidents & steps to be taken in such accidents.	10	5	