



**CONDENSED COURSE IN  
TOOL & DIE MAKING  
(CCTDM)**



**curriculum**

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

## COURSE/MODULE TEMPLATE

**SEMESTER: 1ST**

**COURSE NAME: CONDENSED COURSE IN TOOL AND DIE MAKING**

**COURSE CODE: MSME/CCTDM/29**

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

1. Work independently on different type of conventional machines and Prepare the parts of the component
2. Identify & use different cutting tool.
3. Prepare the component drawing, strip layout, and calculate the tonnage, plate sizes, decide feeding of strip.
4. Generate drafting models in AutoCAD.
5. Prepare 3D modeling in AutoCAD.
6. Work with different types of G & M codes.
7. Write programs of CNC lathe & milling using different controller.
8. Work independently on CNC lathe, CNC milling.
9. Make 2D & surface modeling in Master CAM.
10. Generate tool path using Master CAM.

**THEORY HOURS: 312**

**PRACTICAL HOURS: 468**

**THEORY MARKS: 800**

**PRACTICAL MARKS: 400**

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH hours	Marks
UNIT-I	Production Technology	Manufacture components using various machine tools like Lathe, Milling, Grinding	Workshop safety rules Use of personal protective equipment (PPE). Cutting tool materials. Parts of lathe machine and their function. Lathe and Lathe operations Milling and Milling Operations Grinding and Grinding operations. De-burring process Cutting Tools Coolants and Lubricants Accessories and Attachments	36	100
UNIT-II	Auto CAD	Prepare production drawing using AutoCAD.	Co-ordinate system, used in AutoCAD. interface of AutoCAD, mouse function, functional keys, shortcut keys, paper size Window limits, line, construction line, ray, trim, extend, erase. Circle, rectangle, copy, move, and offset, rotate. Array, mirror, scale, stretch, polyline, polygon, and arc. Spline, ellipse, revision cloud, and region, explode, join, break, and break at a point. point, point style, divide,	32	100

			<p>measure, fillet, chamfer, blend curve</p> <p>Hatch, gradient, details of sectional view.</p> <p>Text, Mtext, text style, arc aligned text, mirror text</p> <p>Block, Wblock, insert block, edit block</p> <p>Identify dimension toolbar, Dimension style &amp; GD&amp;T symbols</p> <p>Plotting and printing drawing.</p>		
UNIT-III	Part Programming	Write programs of CNC lathe & milling using part programming with different controller.	<p>Introduction to automation &amp; basic concept of NC.</p> <p>Introduction to G-code &amp; M-code and Co-ordinate system (Polar and Cartesian coordinate system).</p> <p>NC parameters &amp; ISO programme for linear cut.</p> <p>Circular interpolation (clock wise and counter clock wise) and radius compensation.</p> <p>Length compensation &amp; drilling operation</p> <p>Introduction to machining center, zero offset setting (reference point, programme zero point, machine zero point) limitation.</p> <p>Datum setting, Z axis zero setting during uses of various sizes of tools.</p>	30	100
UNIT-IV	Master CAM	Prepare 2D & surface modelling in Master CAM and generate tool path and detailed programme.	<p>Introduction to Master CAM, sketch option (circle, arc, trim, extend).</p> <p>Application of break, rectangle, polygon, fillet chamfer, spline, translate, mirror, ellipse command.</p> <p>Rotate scale stretch, offset, rectangular array.</p> <p>Surface modeling, type of surface (curve generated, parametric, extrude, revolve, draft, fillet, trim surface, split, extend, swept, fillet, blend, net).</p> <p>Solid modeling (extrude, revolve, loft, sweep, Boolean operation).</p> <p>Generation of 2D tool path in milling (facing, pocketing, contouring, and drilling).</p> <p>Generation of NC code.</p> <p>Generation of 3D tool path in milling-roughing (parallel, radial, pocket, flow line).</p> <p>Semi finishing operations like (contour, rest mill).</p> <p>Finishing operations like (parallel, radial, flow line, pencil, scallop &amp; project).</p> <p>Machining on CNC Lathe (facing, rough turning, grooving &amp; threading).</p>	32	100
UNIT-V	Engineering Drawing	Prepare manufacturing drawing following ISO Standard and interpret the	<p>Introduction of Engineering drawing.</p> <p>Setting of paper size, drawing of title block with border line.</p>	80	100

		drawing to manufacture the component	Drawing of Types of line, their properties, and arrow head. Types of scale, dimensioning rules & their uses. Orthographic projection, types of projection and applying symbol of projection. Orthographic projection from the given Isometric view. Isometric view from the given orthographic views. Sectioning and types of sectioning with complete dimensions. Assembly drawing. Study of production drawings.		
UNIT-VI	Material Technology	Explain the properties of various ferrous and Nonferrous materials and apply the knowledge to manufacture the component.	Engineering materials & classification of material. Properties of material and classification of mechanical properties. Types of iron and their extraction process. Different types of furnaces used for iron extraction. Steel, its production process. Classification of steel including special types of steels. Concept of Heat treatment-softening and hardening process: various types of heat treatment process to strengthen the metal.	24	100
UNIT-VII	Metrology	Use different kind of measuring and checking instruments to manufacture component with desired level of accuracy and standard.	Types of standardization of measuring instruments. Types of measuring instruments. (Direct, Indirect, Linear, Angular) Different type's standardization of Angular measuring instruments. Calculation of least count of measuring instruments. Errors in Measuring process. Concept of Limit, Fit, Tolerance. Types of Fit, their standards, types of fit (Clearance, Transition, Interference fit) and uses. Tolerance, types of tolerance (Unilateral, Bi lateral), their standards and their uses. Uses of gauges. Types of gauges and their uses (Feeler Gauge, Radius Gauge, Screw Pitch Gauge, Telescopic Gauge, Slip Gauge, Standard Wire Gauge, Plug Gauge, Thread Plug Gauge, Snap Gauge, Ring Gauge, Thread Ring Gauge). CMM. Use of Height Master, Profile Projector, Comparators.	24	100
UNIT-VIII	Press Tool Theory	Demonstrate various press operations using different kind of press tools. Demonstrate different parts	Concept of press tool. Types of press operation (shearing and non-shearing operation). Types of punches and dies.	54	100

		of press tools, their functions and materials used to prepare the tool	Design of strip lay out. Calculation of cutting force (tonnage) and plate sizes. Calculation of parameters like die margin, die land, shear angle. Knowledge of types of dies (progressive dies, inverted dies, compound dies). Accessories used in a press tool		
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**SEMESTER: 2ND**

**COURSE NAME: CONDENSED COURSE IN TOOL AND DIE MAKING**

**COURSE CODE: MSME/CCTDM/29**

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

1. Work independently on different Non-conventional machines like EDM, Wire EDM.
2. Identify and use of different tools in EDM & Wire EDM machine.
3. Prepare the component drawing, strip layout, Design Ejection system and calculate the tonnage, plate sizes, decide feeding of strip.
4. Identify different types of mould with its parts.
5. Design component drawing, calculate the plate sizes, injection system and ejection system, type of core and cavity used.

**THEORY HOURS: 212**

**PRACTICAL HOURS: 568**

**THEORY MARKS: 800**

**PRACTICAL MARKS: 400**

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH hours	Marks
UNIT-I	Press Tool Design	Design and develop common type of press Tools for shearing and non-shearing operations	Demonstration on press tool & function of it. Types of press operation like shearing (blanking, piercing, perforating) & none shearing (bending, coining, embossing etc.) operation. Strip layout, basic blank size. Blank positioning, different blank layout, case study on strip layout. Scrap allowance, strip margin selection for rectangular or circular profile, % of utilization. Die set, types of Die set, full proofing of Die Set. Trouble shooting the die set.	36	100

			<p>Drilling procedure to assemble the plates in top and bottom plate.</p> <p>Die profiles, their machining process in the machines, types of clearance to be provided, land margin to be left in the dies.</p> <p>Cutting force, calculation of Stripping force.</p> <p>Die block construction, die material, thickness &amp; heat treatment processes.</p> <p>Full proofing of the strip movement.</p> <p>Construction of the Punches, categories of punch &amp; mounting of punches.</p> <p>Design of Thrust plate, material &amp; heat treatment.</p> <p>Design of strip guide with proper dimensions.</p> <p>Assembly of all the plates, punches with screws and dowels, and trouble shoot during the assembly.</p>		
UNIT-II	Mould Manufacturing	<p>Demonstrate about Moulds.</p> <p>Explain Component drawing for material, shape, shrinkage &amp; parting surface.</p> <p>Demonstrate design process of core &amp; cavity Inserts.</p> <p>Explain design procedures of cavity plate, core plate.</p> <p>Explain mould base elements like Top &amp; Bottom Plates, Core back plate, &amp; guiding elements such as Guide pillar &amp; Guide bush.</p> <p>Demonstrate feed system elements like locating ring, Sprue bush, runner &amp; gate.</p> <p>Demonstrate two plate Injection mould with single cavity and multi cavity.</p> <p>Demonstrate cavity and core cooling system and Sprue Puller.</p> <p>Explain to prepare part drawings with GD &amp; T symbols with Mould parts.</p>	<p>Layout of impression &amp; balanced layout.</p> <p>Concept of mould, its terminology, parts of the mould.</p> <p>Construction of standard mould bases.</p> <p>Calculation of mould parameters like shot weight, injection pressure, day light distance, ejection bar movement, standard mould base size, and ejection system.</p> <p>Pre tooling of parts of the mould.</p> <p>Determination of insert size, mould plate length for ordering standard mould base.</p> <p>Core and cavity of the mould.</p> <p>Types of core and cavity used in mould. (Integer type and inserted type).</p> <p>Method of fitting local inserts.</p> <p>Types of mould like Hand injection mould, semi-automatic injection mould, automatic mould, split mould, hot runner mould.</p> <p>Actuation of core plate, core retainer plate, spacer, ejector plate, feed button, guide pillar, push back pin, sprue puller pin &amp; material of all parts of mould.</p> <p>Parts involved in injection mould top half its component locating ring, sprue bush, runner, gate, top plate, cavity plate, cavity inserts, guide pillar &amp; guide bush.</p> <p>Design of feed and Injection system, path of injection like locating ring, sprue bush, runner and its types, gate and its type.</p>	36	100

			<p>Ejection system and types of ejection like pin ejection, stripper ejection, blade ejection, sleeve ejection.</p> <p>Assembly of the mould.</p> <p>Types of parting line.</p> <p>Description on hand injection moulding machine, automatic injection moulding machine.</p> <p>Parameter to set on the machine like injection pressure, holding time.</p>		
UNIT-III	Modern Manufacturing Technology	<p>Demonstrate theory and principle of non-conventional machining process and their types.</p> <p>Demonstration of EDM machine.</p> <p>Explain about Setting of Work piece.</p> <p>Tool material, dialing, and Tool off setting process.</p> <p>Demonstration of Wire EDM machine, Tool material, dialing and setting of tool.</p> <p>Explain properties and characteristics of Di electric fluid.</p>	<p>Theory and principle of non-conventional machining process.</p> <p>Types of non-conventional machining process</p> <p>Introduction and classification of EDM.</p> <p>Demonstration of EDM machine.</p> <p>Setting of Work piece.</p> <p>Tool material, dialing, and Tool off setting process.</p> <p>Machining principle of EDM.</p> <p>Di electric fluid used its properties and characteristics.</p> <p>Tool material, dialing and setting of tool.</p> <p>Design of component and generation of machining codes by using ELCAM software.</p> <p>Tool path generation and sending to machine.</p> <p>Properties and characteristics of Di electric fluid.</p> <p>Demonstration of Laser beam machine and its operation.</p> <p>Parameters used. Advantages and disadvantages of the process.</p> <p>Safety to be followed during the operation.</p>	20	100
UNIT-IV	Jigs and Fixtures	<p>Demonstrate application of jigs &amp; fixture.</p> <p>Demonstrate drill jigs &amp; selection of fixtures on the basis of component.</p> <p>Discussion on locator types.</p> <p>Demonstrate location principle of locator, dowel locator, diamond pin locator etc.</p>	<p>Concept of drill Jig and fixture.</p> <p>Process to restrict degrees of freedom of an object while machining.</p> <p>Types and manufacturing of drill jig.</p> <p>Types and uses of fixture for a particular operation.</p> <p>Manufacturing of different types of fixture upon requirement.</p> <p>Locating principles in a jig,</p> <p>Discussion on locator types.</p> <p>Discussion on location principle of locator, dowel locator, diamond pin locator etc.</p>	36	100
UNIT-V	Mould Theory	<p>Demonstrate about Moulds.</p> <p>Explain molding machines &amp; types of moulds.</p> <p>Demonstrate compression mould, Injection mould, and Transfer mould.</p> <p>Demonstrate injection mould and standard mould</p>	<p>Introduction to mould, its parts, types of moulds.</p> <p>Types of standard mould bases, core and cavity of mould, types of core and selection of suitable core.</p> <p>Arrangement of plate's assembly of the mould.</p> <p>Injection system like locating</p>	36	100

		<p>base.          Demonstrate parting line, guiding elements.          Demonstrate gate &amp; runner of mould.          Demonstrate ejection system &amp; cooling system.          Demonstrate split moulds.          Demonstrate dog leg cam mould</p>	<p>ring, sprue, runner, gate and their types.          Ejection system like pin, stripper, blade, sleeve.          Calculation of injection pressure standard mould base size, parts sizes etc.          Calculation of spacer sizes for easy ejection.</p>		
UNIT-VI	Communicative English	<p>Demonstrate Communication Skills, use language as a tool of communication.          Demonstrate and improve the participant's English language skills.          Demonstrate Personality Development          Demonstrate Full Dress Rehearsal</p>	<p>Introduction to Basics of communication – forms, types, purpose, theory, examples from day to day life.          Introduction to soft skills.          Introduction to nonverbal communication – body language          English Language Lab:          Objective: The objective of the module is to improve the participant's English language skills.          The Sounds of English – Vowels &amp; Consonant.          Word Accent – Accent, Tone, Pitch          Voice Modulation.          Personality Development          Presentation Skills – elocution, debates, extempore, Newspaper reading.          Introduction to Body Language – positive gestures, handshakes, eye contact, smiles, styles of walking, hand movements, etc.          Activities on Listening Skill          Role Plays and Situation Handling          Etiquette and Manners – general and specific, greetings/salutations, etc.          Personal and Professional Goal Setting.          Personal and Career Development (Career Counseling).          Group Discussion: the theoretical inputs are supplemented with practical exercises.          Methodology:          One- to-one interaction &amp; group exercises.          Role plays, situation handling techniques for above skills.          Corporate Interface:          Methodology: : Full Dress Rehearsal          Presentation of an effective cover letter, resume/curriculum vitae          Group Discussion.          Personal Interview.          Corporate Interface.</p>	24	100
UNIT-VII	Industrial	Demonstrate about industry	Concept Of organization	24	100



	Management	and their types. Demonstrate the human relation and behavioural skill. Explain the work culture followed in a group in industry. Demonstrate marketing Strategy	structure, and types of industries. Role and nature of work. Personal benefit and service to industries as well as society concerned. Personal attitude and behavioral skill towards your boss, colleagues concerned. Punctuality and time management skill. Communication of your thoughts with sub ordinates. Entrepreneurship Development		
UNIT-VIII	In plant Training and Project Work		***	***	200

## COURSE WISE DETAILS CONTENTS

**Program Name** : CONDENSED COURSE IN TOOL AND DIE MAKING  
**Semester** : 1ST  
**Course Title** :Production Technology  
:Auto CAD  
:Part Programming  
:Master CAM  
:Engineering Drawing  
:Material Technology  
:Metrology  
:Press Tool Theory  
**Course Code** : MSME/CCTDM/29

### **Rationale:**

Indian manufacturing industry sector which comprises majority of Small & Medium scale enterprises requires highly skilled “Tool & Die makers” who can be engaged in production of precision tools & components with minimum wastages of time, money and material. The aim of the training is to develop highly skilled Tool Makers to contribute in the overall development of the Indian industry through use of modern technology such as, Computer Aided Manufacturing (CAM)/ Computer Aided Designing (CAD)/ Computer Aided Engineering (CAE).

### **Outcomes:**

Design tools, dies jigs and fixtures for required component need to be machined.

Develop tools, dies jigs and fixtures for required component need to be machined.

Manufacture tools, dies jigs and fixtures for required component need to be machined.

Topic and Contents	Hours	Marks
<b>Topic 1: Production Technology</b>	36	100
<b>MAJOR CHAPTERS</b>		
➤ Importance of safety & general precaution observed in the industry/shop floor (10 Marks)		
➤ Files (20 Marks)		
➤ lathe Machine (20 Marks)		

<ul style="list-style-type: none"> <li>➤ Milling Machine (20 Marks)</li> <li>➤ Grinding Machine (20 Marks)</li> <li>➤ Drilling Machine (10 Marks)</li> </ul>		
<p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>➤ 1.1 Importance of safety &amp; general precaution observed in the industry/shop floor: (10 Marks) <ul style="list-style-type: none"> <li>• Introduction to first aid ,</li> <li>• operation of electrical mains ,</li> <li>• Introduction of PPE.</li> <li>• Introduction of 5S ,concept &amp;application</li> <li>• Responses to emergencies e.g. power failure, fire etc.</li> </ul> </li> <li>➤ 1.2 Use of Files: (20 Marks) <ul style="list-style-type: none"> <li>• Introduction to files,</li> <li>• Classification and specification file, (Length, cut, grade, shape) Types of filing (Straight filing, Cross filing, Draw filing).</li> <li>• Advantages and disadvantages of filing.</li> <li>• Marking procedure,</li> <li>• Instruments used for marking,</li> <li>• Safety of keeping marking tools.</li> </ul> </li> <li>➤ 1.3 lathe Machine: (20 Marks) <ul style="list-style-type: none"> <li>• Introduction to the Lathe,</li> <li>• Classification and specification ,</li> <li>• work holding and tool holding devices,</li> <li>• accessories and attachment used in lathe,</li> <li>• Tools used in lathe,</li> <li>• Grinding of Single point cutting tool.</li> <li>• Different turning operation performed on lathe like facing, turning, chamfering, center drilling, in between center turning.</li> <li>• Forming operation like Radius Forming, Grooving, Knurling, Die Passing, Thread Cutting, Drilling and Boring.</li> </ul> </li> <li>➤ 1.4 Milling Machine (20 Marks) <ul style="list-style-type: none"> <li>• Introduction to Milling machine,</li> <li>• Classification and Specifications,</li> <li>• Different operations performed,</li> <li>• Work holding and tool holding devices (v-blocks, vices, fixtures, stub arbors, collet adaptors) used on it.</li> <li>• Classification of milling i.e. Face milling, Peripheral</li> </ul> </li> </ul>		

<p>milling (up&amp; down milling) profile milling.</p> <ul style="list-style-type: none"> <li>• Explain about milling machine operations,</li> <li>• Its attachments.</li> <li>• Calculation of RPM &amp; feed.</li> <li>• Different milling operation like Slot Milling, Special Milling.</li> </ul> <p>➤ 1.5 Grinding Machine: (20 Marks)</p> <ul style="list-style-type: none"> <li>• Introduction to grinding machine,</li> <li>• Classification and specification of the machine,</li> <li>• types of grinding (surface grinding, reference grinding, slot grinding), work holding devices,</li> <li>• advantages and disadvantages of grinding,</li> <li>• Safety precaution to be taken during grinding.</li> <li>• Angular grinding by using Sine vice.</li> </ul> <p>➤ 1.6 Drilling Machine: (10 Marks)</p> <ul style="list-style-type: none"> <li>• Introduction to Drilling process,</li> <li>• tools used in drilling,</li> <li>• checking the tool by using point angle gauge,</li> <li>• Assembly of all the parts,</li> <li>• Finding the problems and remedies of that.</li> </ul>		
<p><b>Topic 2: Auto CAD</b></p> <p><b>MAJOR CHAPTERS</b></p> <ul style="list-style-type: none"> <li>➤ 2D &amp; 3D sketches (30 Marks)</li> <li>➤ Dimensioning (30 Marks)</li> <li>➤ 3D Modeling (40 Marks)</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>➤ 2.1 2D &amp; 3D sketches (30 Marks)</li> <li>• Setting of paper size,</li> <li>• different types of lines,</li> <li>• Coordinate system &amp; text.</li> <li>• functional keys</li> <li>• Tool line, circle, and rectangle, modify tools, trim, offset, fillet &amp; chamfer.</li> <li>• Layers &amp; discussion on layer management.</li> <li>• Poly line, rectangle, polygon, and arc, modify tools, mirror, pattern, copy.</li> <li>• Hatch, copy &amp; move.</li> <li>➤ 2.2 Dimensioning (30 Marks)</li> </ul>	32	100

<ul style="list-style-type: none"> <li>• Scale tools and thread representation.</li> <li>• Dimension and attribute text.</li> <li>• Ellipse, arc, and poly line.</li> <li>• Arc, aligned text, spline, &amp; dimension setting.</li> <li>• Dimension style and dimensional tolerance &amp; limits.</li> <li>• UCS, WCS</li> <li>➤ 2.3 3D Modeling (40 Marks)</li> <li>• Isometric view by wire frame.</li> <li>• Extrude, Revolve, Union, and Subtraction &amp; Intersection, sweep, and extrude face.</li> <li>• Solid primitives, solid editing command (move face, offset face).</li> <li>• Assembly drawing &amp; attribute text.</li> <li>• Annotation, block &amp; w-block &amp; leader.</li> <li>• Extension files used (.dwt, .scr, and slide).</li> <li>• Primitives used in solid modeling.</li> </ul>		
<p><b>Topic 3: Part Programming</b></p> <p><b>MAJOR CHAPTERS</b></p> <ul style="list-style-type: none"> <li>➤ Introduction to Programming (30 Marks)</li> <li>➤ 2D Programming (30 Marks)</li> <li>➤ Machine Setting (40 Marks)</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>➤ 3.1 Introduction to Programming (30 Marks) <ul style="list-style-type: none"> <li>• Automation &amp; basic concept of NC.</li> <li>• G-code &amp; M- code and Co-ordinate system (Polar and Cartesian coordinate system).</li> <li>• NC parameters &amp; ISO programme for linear cut.</li> </ul> </li> <li>➤ 3.2 2D Programming (30 Marks) <ul style="list-style-type: none"> <li>• circular interpolation (clock wise and counter clock wise)</li> <li>• Radius compensation.</li> <li>• Length compensation &amp; drilling</li> </ul> </li> </ul>	30	100
<p><b>Topic 4: Master CAM</b></p> <p><b>MAJOR CHAPTERS</b></p> <ul style="list-style-type: none"> <li>➤ 2D Sketches (30 Marks)</li> <li>➤ Surface &amp; Solid Modeling (30 Marks)</li> <li>➤ 2D &amp; 3D Tool Path (40 Marks)</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>➤ 4.1 2D Sketches (30 Marks)</li> </ul>	32	100

<ul style="list-style-type: none"> <li>• Sketch option (circle, arc, trim, extend).</li> <li>• Application of break, rectangle, polygon, fillet chamfer, spline, translate, mirror, ellipse command.</li> <li>• Rotate scale stretch, offset, rectangular array.</li> <li>➤ 4.2 Surface Modeling (30 Marks)</li> <li>• Type of surface (curve generated, parametric, extrude, revolve, draft, fillet, trim surface, split, extend, swept, fillet, blend, net).</li> <li>• Solid modeling (extrude, revolve, loft, sweep, Boolean operation).</li> <li>➤ 4.3 2D &amp; 3D Tool Path (40 Marks)</li> <li>• 2D tool path in milling (facing, pocketing, contouring, and drilling).</li> <li>• Generation of NC code.</li> <li>• Generation of 3D tool path in milling-roughing (parallel, radial, pocket, flow line).</li> <li>• Semi finishing operations like (contour, rest mill).</li> <li>• Finishing operations like (parallel, radial, flow line, pencil, scallop &amp; project). Demonstration lathe machining (facing, rough turning, grooving &amp; threading).</li> </ul>		
<p><b>Topic 5: Engineering Drawing</b></p> <p><b>MAJOR CHAPTERS</b></p> <ul style="list-style-type: none"> <li>➤ Drawing equipment's and its application (25 Marks)</li> <li>➤ Orthographic Projection (25 Marks)</li> <li>➤ Isometric projection (25 Marks)</li> <li>➤ Sectioning (25 Marks)</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>➤ 5.1 Drawing equipment and its application (25 Marks) <ul style="list-style-type: none"> <li>• What is drawing?</li> <li>• Concept and Introduction of Engineering drawing.</li> <li>• Setting of paper size, drawing of title block with border line.</li> <li>• Drawing of Types of line, their properties, and arrow head.</li> <li>• Types of scale, dimensioning rules &amp; their uses.</li> </ul> </li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>➤ 5.2 Orthographic Projection (25 Marks) <ul style="list-style-type: none"> <li>• Concept of projection,</li> <li>• Types of projection and applying symbol of projection.</li> </ul> </li> </ul> <p><b>Contents:</b></p>	80	100

<ul style="list-style-type: none"> <li>➤ 5.3 Isometric projection (25 Marks) <ul style="list-style-type: none"> <li>• Isometric scale</li> <li>• Isometric view</li> </ul> </li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>➤ 5.4 Sectioning (25 Marks) <ul style="list-style-type: none"> <li>• Types</li> <li>• Application</li> <li>• View positioning</li> </ul> </li> </ul>		
<p><b>Topic 6: Material Technology</b></p> <p><b>MAJOR CHAPTERS</b></p> <ul style="list-style-type: none"> <li>➤ Material and its classification (25 Marks)</li> <li>➤ Extraction (25 Marks)</li> <li>➤ Steels (25 Marks)</li> <li>➤ Heat Treatment (25 Marks)</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>➤ 6.1 Material and its classification (25 Marks) <ul style="list-style-type: none"> <li>• Engineering material,</li> <li>• Classification of material.</li> <li>• Properties of material</li> <li>• Classification of mechanical properties.</li> </ul> </li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>➤ 6.2 Extraction (25 Marks) <ul style="list-style-type: none"> <li>• Types of iron and their extraction process.</li> <li>• Different types of furnaces used for iron extraction.</li> </ul> </li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>➤ 6.3 Steels (25 Marks) <ul style="list-style-type: none"> <li>• Steel, its production process.</li> <li>• Classification of steel including special types of steels.</li> </ul> </li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>➤ 6.4 Heat Treatment (25 Marks) <ul style="list-style-type: none"> <li>• Concept of Heat treatment-</li> <li>• softening and hardening process:</li> <li>• Various types of heat treatment process to strengthen the metal.</li> </ul> </li> </ul>	24	100
<p><b>Topic 7: Metrology</b></p> <ul style="list-style-type: none"> <li>➤ Linear measuring instruments. (30 Marks)</li> <li>➤ Angular measuring instruments. (30 Marks)</li> <li>➤ Gauges and comparators. (40 Marks)</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>➤ 7.1 linear measuring instruments. (30 Marks)</li> </ul>	24	100

<ul style="list-style-type: none"> <li>• Standardization of linear measuring instrument.</li> <li>• Vernier Caliper</li> <li>• micrometer</li> <li>• Height Gauge</li> </ul> <p>➤ 7.2 angular measuring instruments. (30 Marks)</p> <ul style="list-style-type: none"> <li>• Standardization of angular measuring instrument.</li> <li>• Angle protractor</li> <li>• Vernier/universal angle protractor</li> <li>• sine bar</li> </ul> <p>➤ 7.3 gauges and comparator (40 Marks)</p> <ul style="list-style-type: none"> <li>• Standardization of Gauges (standard gauge: feeler gauge, radius gauge, screw pitch gauge).</li> <li>• Limit, fit and tolerance.</li> <li>• Limit gauge: plug gauge, thread plug gauge, snap gauge.</li> <li>• Ring gauge, thread ring gauge.</li> <li>• Comparators as well as hand on practice on different measuring instruments.</li> </ul>		
<p><b>Topic 8: Press Tool Theory</b></p> <p>➤ Introduction (30 Marks)</p> <p>➤ Design (30 Marks)</p> <p>➤ Dies (40 Marks)</p> <p><b>Contents:</b></p> <p>➤ 8.1 Introduction (30 Marks)</p> <ul style="list-style-type: none"> <li>• Concept of press tool.</li> <li>• Types of press operation (shearing and non-shearing operation).</li> <li>• Types of punches and dies.</li> </ul> <p>➤ 8.2 Design (30 Marks)</p> <ul style="list-style-type: none"> <li>• Design of strip lay out.</li> <li>• Calculation of cutting force (tonnage) and plate sizes.</li> <li>• Calculation of parameters like die margin, die land, shear angle.</li> </ul> <p>➤ 8.3 Dies (40 Marks)</p> <ul style="list-style-type: none"> <li>• Knowledge of types of dies (progressive dies, inverted dies)</li> </ul>	54	100
<b>Total</b>	312	800



**Program Name : CONDENSED COURSE IN TOOL AND DIE MAKING**

**Semester : 2ND**

**Course Title : Press tool Design**  
**:Mould Manufacturing**  
**:Modern Manufacturing Technology**  
**:Jigs and Fixture**  
**:Mould Theory**  
**:Communicative English**  
**:Industrial Management**

**Course Code : MSME/CCTDM/29**

**Rationale:**

Indian manufacturing industry sector which comprises majority of Small & Medium scale enterprises requires highly skilled “Tool & Die makers” who can be engaged in production of precision tools & components with minimum wastages of time, money and material. The aim of the training is to develop highly skilled Tool Makers to contribute in the overall development of the Indian industry through use of modern technology such as, Computer Aided Manufacturing (CAM)/ Computer Aided Designing (CAD)/ Computer Aided Engineering (CAE).

**Outcomes:**

Design tools, dies jigs and fixtures for required component need to be machined.

Develop tools, dies jigs and fixtures for required component need to be machined.

Manufacture tools, dies jigs and fixtures for required component need to be machined

**THEORY:**

Topic and Contents	Hours	Marks
<p><b>Topic 9: Press Tool Design</b></p> <p><b>MAJOR CHAPTERS</b></p> <ul style="list-style-type: none"> <li>➤ Types and function of parts (10 Marks)</li> <li>➤ Use of Die set (10 Marks)</li> <li>➤ Die plate design (20 Marks)</li> <li>➤ Punch Design (20 Marks)</li> <li>➤ Design of other parts (20 Marks)</li> <li>➤ Assembly of press tool (20 Marks)</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>➤ 9.1 Types and function of parts: (10 Marks) <ul style="list-style-type: none"> <li>• Demonstration on press tool &amp; function of it.</li> <li>• Types of operation (blanking, piercing, perforating) &amp; none shearing (bending, coining, embossing etc.)</li> <li>• Strip layout, basic blank size.</li> <li>• Blank positioning, different blank layout, case study on strip layout.</li> <li>• Scrap allowance, strip margin selection for rectangular or circular profile, % of utilization.</li> </ul> </li> <li>➤ 9.2 Use of Die set: (10 Marks) <ul style="list-style-type: none"> <li>• Die set, types of Die set, full proofing of Die Set.</li> <li>• Trouble shoot in the die set.</li> <li>• Drilling procedure to assemble the plates in top and bottom plate.</li> </ul> </li> <li>➤ 9.3 Die plate Design: (20 Marks) <ul style="list-style-type: none"> <li>• Die profiles, their machining process in the machines, types of clearance to be provided, land margin to be left in the dies.</li> <li>• Cutting force, calculation of Stripping force.</li> <li>• Die block construction, die material, thickness &amp; heat treatment processes.</li> </ul> </li> <li>➤ 9.4 Punch Design (20 Marks) <ul style="list-style-type: none"> <li>• Construction of the Punches, categories of punch &amp; mounting of punches.</li> <li>• Demonstration machining of punches by milling and</li> </ul> </li> </ul>	<p>36</p>	<p>100</p>

<p>grinding machines.</p> <ul style="list-style-type: none"> <li>➤ 9.5 Design of Other parts: (20 Marks) <ul style="list-style-type: none"> <li>• Design of Thrust plate, material &amp; heat treatment.</li> <li>• Design of strip guide with proper dimensions.</li> </ul> </li> <li>➤ 9.6 Assembly of press tool: (20 Marks) <ul style="list-style-type: none"> <li>• Assembly of all the plates, punches with screws and dowels, and trouble shoot during the assembly.</li> </ul> </li> </ul>		
<p><b>Topic 10: Mould Manufacturing</b></p> <p><b>MAJOR CHAPTERS</b></p> <ul style="list-style-type: none"> <li>➤ Lay out and parts details (30 Marks)</li> <li>➤ Inserts , cores and cavity (30 Marks)</li> <li>➤ Types of Mould (40 Marks)</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>➤ 10.1 Lay out and parts details (30 Marks) <ul style="list-style-type: none"> <li>• Layout of impression &amp; discussion on balanced layout.</li> <li>• Concept of mould, its terminology, parts of the mould.</li> <li>• Construction of standard mould bases.</li> <li>• Parameters to be calculated like shot weight, injection pressure, daylight distance, ejection bar</li> <li>• Movement, standard mould base size, and ejection system.</li> <li>• Pre tooling of parts of the mould.</li> </ul> </li> <li>➤ 10.2 Inserts , cores and cavity (30 Marks) <ul style="list-style-type: none"> <li>• Finding out insert size, mould plate length for ordering standard mould base.</li> <li>• Core and cavity of the mould.</li> <li>• Types of core and cavity used in mould. (Integer type and inserted type).</li> <li>• Method of fitting local inserts.</li> </ul> </li> <li>➤ 10.3 Types of Mould (40 Marks) <ul style="list-style-type: none"> <li>• Types of mould like Hand injection mould, semi-automatic injection mould, automatic mould, split mould,</li> <li>• Hot runner mould.</li> <li>• Actuation of core plate, core retainer plate, spacer, ejector plate, feed button, guide pillar, push back pin, sprue puller pin &amp; material of all parts of mould.</li> <li>• Parts involved in injection mould top half its component locating ring, sprue bush, runner, gate, top plate, cavity plate, cavity inserts, guide pillar &amp; guide bush.</li> <li>• Follow SOP to complete the spoon mould.</li> </ul> </li> </ul>	36	100

<ul style="list-style-type: none"> <li>• Design of feed and Injection system, path of injection like locating ring, sprue bush, runner and its types, gate and its type.</li> <li>• Ejection system and types of ejection like pin ejection, stripper ejection, blade ejection, sleeve ejection.</li> <li>• Assembly of the mould.</li> <li>• Types of parting line.</li> <li>• Description on hand injection moulding machine, automatic injection moulding machine.</li> <li>• Parameter to set on the machine like injection pressure, holding time.</li> </ul>		
<p><b>Topic 11: Modern Manufacturing Technology</b></p> <p><b>MAJOR CHAPTERS</b></p> <ul style="list-style-type: none"> <li>➤ Types of machines (30 Marks)</li> <li>➤ EDM/WEDM (30 Marks)</li> <li>➤ LBM (40 Marks)</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>➤ 11.1 Types of machines (30 Marks) <ul style="list-style-type: none"> <li>• Theory and principle of non-conventional machining process.</li> <li>• Types of non-conventional machining process</li> </ul> </li> <li>➤ 11.2 EDM/WEDM (30 Marks) <ul style="list-style-type: none"> <li>• Demonstration of EDM machine.</li> <li>• Setting of Work piece.</li> <li>• Tool material, dialing, and Tool off setting process.</li> <li>• Machining principle of EDM.</li> <li>• Dielectric fluid used its properties and characteristics</li> <li>• Demonstration of Wire EDM machine.</li> <li>• Tool material, dialing and setting of tool.</li> <li>• Design of component and generation of machining codes by using ELCAM software</li> <li>• Tool path generation and sending to machine.</li> <li>• Properties and characteristics of Di electric fluid.</li> </ul> </li> <li>➤ 11.3 LBM (40 Marks) <ul style="list-style-type: none"> <li>• Demonstration of Laser beam machine and its operation.</li> <li>• Parameters used. Advantages and disadvantages of the process.</li> <li>• Safety to be followed during the operation.</li> </ul> </li> </ul>	36	100

<p><b>Topic 12: Jigs and Fixture</b></p> <p><b>MAJOR CHAPTERS</b></p> <ul style="list-style-type: none"> <li>➤ Introduction (30 Marks)</li> <li>➤ Types (30 Marks)</li> <li>➤ Locating (40 Marks)</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>➤ 12.1 Introduction (30 Marks) <ul style="list-style-type: none"> <li>• Concept of drill Jig and fixture.</li> <li>• Process to restrict degrees of freedom of an object while machining.</li> </ul> </li> <li>➤ 12.2 Types (30 Marks) <ul style="list-style-type: none"> <li>• Types and manufacturing of drill jig.</li> <li>• Types and uses of fixture for a particular operation.</li> <li>• Manufacturing of different types of fixture upon requirement.</li> </ul> </li> <li>➤ 12.3 Locating (40 Marks) <ul style="list-style-type: none"> <li>• Locating principles in a jig, Discussion on locator types.</li> </ul> </li> </ul> <p>Discussion on location principle of locator, dowel locator, diamond pin locator etc.</p>	36	100
<p><b>Topic 12: Jigs and Fixture</b></p> <p><b>MAJOR CHAPTERS</b></p> <ul style="list-style-type: none"> <li>➤ Introduction (30 Marks)</li> <li>➤ Types (30 Marks)</li> <li>➤ Locating (40 Marks)</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>➤ 12.1 Introduction (30 Marks) <ul style="list-style-type: none"> <li>• Concept of drill Jig and fixture.</li> <li>• Process to restrict degrees of freedom of an object while machining.</li> </ul> </li> <li>➤ 12.2 Types (30 Marks) <ul style="list-style-type: none"> <li>• Types and manufacturing of drill jig.</li> <li>• Types and uses of fixture for a particular operation.</li> <li>• Manufacturing of different types of fixture upon requirement.</li> </ul> </li> <li>➤ 12.3 Locating (40 Marks) <ul style="list-style-type: none"> <li>• Locating principles in a jig, Discussion on locator types.</li> </ul> </li> </ul> <p>Discussion on location principle of locator, dowel locator, diamond pin locator etc.</p>	36	100

<p><b>Topic 13: Mould Theory</b></p> <p><b>MAJOR CHAPTERS</b></p> <ul style="list-style-type: none"> <li>➤ Types of mould and parts (25 Marks)</li> <li>➤ Standard mould parts (25 Marks)</li> <li>➤ Assembly of moulds (25 Marks)</li> <li>➤ Injection and ejection system (25 Marks)</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>➤ 13.1 Types of mould and parts (25 Marks) <ul style="list-style-type: none"> <li>• Introduction to mould,</li> <li>• its parts,</li> <li>• Types of moulds.</li> </ul> </li> <li>➤ 13.2 Standard mould parts (25 Marks) <ul style="list-style-type: none"> <li>• Types of standard mould bases,</li> <li>• core and cavity of mould,</li> <li>• Types of core and selection of suitable core.</li> </ul> </li> <li>➤ 13.3 Assembly of moulds (25 Marks) <ul style="list-style-type: none"> <li>• Arrangement of plate's assembly of the mould.</li> </ul> </li> <li>➤ 13.4 Injection and ejection system (25 Marks) <ul style="list-style-type: none"> <li>• Injection system like locating ring, sprue, runner, gate and their types.</li> <li>• Ejection system like pin, stripper, blade, sleeve.</li> <li>• Calculation of injection pressure standard mould base size, parts sizes etc.</li> <li>• Calculation of spacer sizes for easy ejection.</li> </ul> </li> </ul> <p>Design of component with suitable type of mould.</p>		
<p><b>Topic 14: Communicative English</b></p> <p><b>MAJOR CHAPTERS</b></p> <ul style="list-style-type: none"> <li>➤ Introduction to Basics of communication (25 Marks)</li> <li>➤ English Language Lab (25 Marks)</li> <li>➤ Personality Development (25 Marks)</li> <li>➤ Group Discussion (25 Marks)</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>➤ 14.1 Introduction to Basics of communication (25 Marks) <ul style="list-style-type: none"> <li>• Forms, types, purpose, theory, examples from day to day life.</li> <li>• Introduction to soft skills.</li> <li>• Introduction to nonverbal communication – body language</li> </ul> </li> <li>➤ 14.2 English Language Lab (25 Marks) <ul style="list-style-type: none"> <li>• The Sounds of English – Vowels &amp; Consonant.</li> <li>• Word Accent – Accent, Tone, Pitch</li> <li>• Voice Modulation.</li> </ul> </li> </ul>	24	100

<ul style="list-style-type: none"> <li>➤ 14.3 Personality Development (25 Marks) <ul style="list-style-type: none"> <li>• Elocution, debates, extempore, Newspaper reading.</li> <li>• Positive gestures, handshakes, eye contact, smiles, styles of walking, hand movements.</li> <li>• Activities on Listening Skill</li> <li>• Role Plays and Situation Handling</li> </ul> </li> <li>➤ 14.4 Group Discussion (25 Marks) <ul style="list-style-type: none"> <li>• One- to-one interaction &amp; group exercises.</li> <li>• Role plays, situation handling techniques for above skills.</li> </ul> </li> </ul>		
<p><b>Topic 15: Industrial Management</b></p> <ul style="list-style-type: none"> <li>➤ Evaluation of Management and Nature of Management. (25Marks)</li> <li>➤</li> <li>➤ Production and Productivity. (25 Marks)</li> <li>➤ Industrial Relation and Acts. (25 Marks)</li> <li>➤ Entrepreneurship development (25 Marks)</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>➤ 15.1 Evaluation of Management and Nature of Management. (25 Marks) <ul style="list-style-type: none"> <li>• Management as function / discipline management and administration.</li> <li>• Levels of management,</li> <li>• role and responsibility</li> </ul> </li> <li>➤ 15.2 Production and Productivity. (25 Marks) <ul style="list-style-type: none"> <li>• Production and Productivity understanding, measures to increase productivity</li> </ul> </li> <li>➤ 15.3 Industrial Relation and Acts (25 Marks) <ul style="list-style-type: none"> <li>• Employee's welfare facilities,</li> <li>• labor participation in management,</li> <li>• discipline,</li> <li>• Safety committee.</li> <li>• Industrial relations,</li> <li>• industrial disputes,</li> <li>• Trade union act rights and liabilities.</li> <li>• Indian factories act definition,</li> <li>• Health provision,</li> <li>• safety provisions welfare provision working hours, accidents,</li> <li>• Penalties,</li> </ul> </li> </ul>	24	100

<ul style="list-style-type: none"> <li>• Miscellaneous provisions.</li> <li>• Payment of wages act,</li> <li>• Workmen’s compensation act,</li> <li>• ESI, PF etc.</li> </ul> <p>➤ Entrepreneurship development (25 Marks)</p>		
<b>Total</b>	212	700

**Intellectual Skills:**

1. Prepare working drawing
2. Select proper material and heat treatment process
3. Use proper measuring tool
4. Design and develop press tool
5. Select suitable jigs and fixtures

**Motor Skills:**

1. Manufacture press tool, moulds and jigs and fixture by selecting different manufacturing methods
2. Develop working drawing using auto cad
3. Generate the programme by using master cam for CNC Machines to produce different profiles.

**List of Practical:**

1. Portable vice
2. Hand injection mould
3. Spoon mould
4. Sharpening of tools and cutters
5. Progressive clip tool
6. Knob mould
7. Fixture for hand injection mould
8. project

**Learning Resources:**

**1. Books:**

Sr. No.	Author	Title	Publisher
1	S.k. Hazra chowdhury	Workshop Technology	Media promoters and publishers pvt ltd
2	N.D Bhatt	Engineering drawing	Charotar publishing house



3	O.P Khanna	Material science	Dhanpath rai and sons
4	R.K Jain	Engineering metrology	Dhanpath rai and sons
5	Cyril Donaldsons	Tool design	Tata McGrawHill
6	R.G.W Pye	Injection Mould Design	Longman
7	O.P.Khanna	Industrial management	Khanna publishers
8	P.H.Joshi	Jigs and fixtures	Mcgraw-Hill Education India Pvt.Ltd