



GOVT.TOOL ROOM & TRAINING CENTRE

SEMESTER: FIFTH

Course: DIPLOMA IN TOOL & DIE MAKING

Syllabus -Theory and practical Subjects

SL. NO	CODE	SUBJECTS	Contact Hours/Week	Contact Hours/ Semester
1	DTDM-VS501	Press Tool Theory-II	3	64
2	DTDM-VS502	Mould Theory-I	3	64
3	DTDM-VS503	Mechatronics	3	64
Practical's				
4	DTDM-VS504	Press Tool Design-I	4	94
5	DTDM-VS505	Mould Design-I	4	94
6	DTDM-VS506	Material Testing Lab	3	64
7	DTDM-VS507	CAD Lab-III	3	64
8	DTDM-VS508	Work Shop – V	17	292

Scheme of Examination

Course: DIPLOMA IN TOOL & DIE MAKING

Sl. No	Sub. Code	Subjects	Contact Hours per Week	Exam Duration	Scheme of Examination				Total Marks	Min marks for passing
					Exam		Internal Assessment			
					Max	Min	Max	Min		
					Marks	Marks	Marks	Marks		
1	DTDM-VS501	Press Tool Theory-II	3	3	100	50	20	10	120	60
2	DTDM-VS502	Mould Theory-I	3	3	100	50	20	10	120	60
3	DTDM-VS503	Mechatronics	3	4	100	50	20	10	120	60
Practical's										
4	DTDM-VS504	Press Tool Design-I	4	8	100	50	20	10	120	60
5	DTDM-VS505	Mould Design-I	4	8	100	50	20	10	120	60
6	DTDM-VS506	Material Testing Lab	3	3	100	50	20	10	120	60
7	DTDM-VS507	CAD Lab-III	3	3	100	50	20	10	120	60
8	DTDM-VS508	Work Shop – V	17	10	900	540	100	60	1000	600
Total			40		1600	890	260	130	1840	1020



PRESS TOOL THEORY – II

SUBJECT CODE: DTDM-VS501

Contact Hrs. /Week: 3

Contact Hrs. / Semester: 64

Learning goals Press Tool Theory- II:

Learning goals for Press Tool Theory:

On completion of this subject, the trainees will be able to:

- Explain different types of non-cutting operations
- Explain the behaviour of material during deformation
- Specifying proper stock materials for non-cutting operations
- Understand the significance of fine blanking operation
- Select proper materials for punch and die and recommend suitable heat treatment operations
- Understand the importance of a combination tool
- Understand the theory of bending and calculate all the required parameters
- Understand the theory of drawing and calculate all the required parameters
- Understand the application of each element in a bending and drawing tool
- Select proper lubricants
- Select a proper press machine for a required operation

Contact Hrs. /Week: 3

Contact Hrs. / Semester: 60

SPECIFIC INSTRUCTIONAL OBJECTIVES:

1. INTRODUCTION TO NON-CUTTING OPERATIONS

- Introduction
- Purpose and applications
- Advantages
- Types of non-cutting operations
- Types of non-cutting press tools
- Behaviour of material during deformation
- Stock material for non-cutting operations

2. FINE BLANKING

- Introduction
- Construction
- Functions
- Operational sequences
- Applications and advantages
- Press selection for fine blanking

3. PUNCH AND DIE

- Materials for punch and die
- Heat treatment of punch and die
- Methods of manufacturing punch and die

4. COMBINATION DIE

- Introduction
- Construction
- Functions
- Advantages and disadvantages
- Manufacturing methods

5. BENDING

- Theory of bending
- Bend elements
- Neutral axis and its importance
- Blank development calculation
- V-bending procedure and force calculation
- U-bending theory and force calculation
- Calculation of bend allowance
- Bending pressure
- Spring back
- Methods of avoiding spring back in U and V bending
- Bending tool – constructional features
- Defects and remedies of bent component and bending tool



6. LUBRICATION

- Purpose of lubricants
- Types of lubricants

7. FORMING OPERATIONS

- Introduction
- Theory of forming
- Types of forming dies
- Purpose and application

8. DRAWING

- Introduction
- Metal flow during drawing
- Calculations – flat blank diameter, draw reductions, number of draws required, draw force
- Variables that affect metal flow during drawing
- Types of draw dies

9. PRESS MACHINE

- Introduction
- Specification
- Classification
- Types of presses
- Power source
- Attachments for presses
- Selection of a press
- Feeding system – purpose, types, advantages

REFERENCE BOOKS:

1. Tool and die maker by Mahajan
2. Design fundamentals by Pacquin
3. Tool design by Donaldson
4. Basic die design by Osterguard
5. Advanced die design by Osterguard

WEEKLY PLAN FOR PRESS TOOL THEORY-2

Week	Chapters	Topics to be covered	Learning Goals
1	Introduction to Non Cutting Operations	<ul style="list-style-type: none"> - Introduction - Purpose and applications Necessity Advantages 	Review Explain operations – Embossing, Coining, Curling, Flanging, Bulging Lowering Etc & Demonstrate different Components
2		<ul style="list-style-type: none"> - Types of non-cutting operations - Types of non-cutting press tools 	
3		<ul style="list-style-type: none"> -Behaviour of material during deformation - Stock material for non-cutting operations. 	Explain Parallel and Perpendicular Grain direction, Ductility, Compression Elongation and Strength Spring Back
4	FINE BLANKING	<ul style="list-style-type: none"> - Introduction - Construction - Functions 	Explain Purpose, Necessity & Advantages & Disadvantage over Conventional blanking. Impinger, Cut band, Edge, Radius, Burr. Cost of tool
5		<ul style="list-style-type: none"> - Operational sequences - Applications and advantages - Press selection for fine blanking 	
6	PUNCH AND DIE	<ul style="list-style-type: none"> - Materials for punch and die - Heat treatment of punch and die - Methods of manufacturing punch and die 	HCHCR, OHNS. Secondary Heat treatment, Quench cracks. Conventional & Non conventional machining
7	COMBINATION DIE	<ul style="list-style-type: none"> - Introduction - Construction - Functions - Advantages and disadvantages - Manufacturing methods 	Explain Construction Purpose, Rigidity.
8	BENDING	<ul style="list-style-type: none"> - Theory of bending - Bend elements - Neutral axis and its importance 	Explain Tension and Compression Bend angle, Radius, Area, Line. Explain construction, Purpose, Necessity & Advantages of wiping dies, Air bend & Bottoming dies Solve problems
9		<ul style="list-style-type: none"> - Blank development calculation - Calculation of bend allowance 	
10		<ul style="list-style-type: none"> - V-bending procedure and force calculation - U-bending theory and force calculation - Wiping Procedure and force calculation 	

11		<ul style="list-style-type: none"> -Bending Tool Construction -Spring Back <hr/> <ul style="list-style-type: none"> -Methods of avoiding spring back -V bending , U bending & wiping Dies 	<p>Radius, Bend Angle & Sheet Thickness.</p> <p>Corner setting, Ironing, Squeezing & Over bending</p>
12	Lubrication	<ul style="list-style-type: none"> - Purpose of lubricants - Types of lubricants 	<p>Mineral oil, Chemicals, Soluble oil, Solvents , Animal fats</p>
13	Forming Operation	<ul style="list-style-type: none"> - Introduction - Theory of forming - Types of forming dies - Purpose and application 	<p>Pressure pad & Solid Forming.</p>
14	DRAWING	<ul style="list-style-type: none"> - Introduction - Metal flow during drawing - Variables that affect metal flow during drawing - Types of draw dies 	<p>Shallow & Deep ,Reverse draw, Single action ,Double action, Push through</p> <p>Punch Radius, Die Radius & Blank Holder</p>
15		<ul style="list-style-type: none"> - Calculations – flat blank diameter, draw reductions, number of draws required, draw force & Cup height 	<p>(Rigid, Spring) Draw beads</p> <p>Solve problems</p>
16		<ul style="list-style-type: none"> - Defects in Drawing operation 	<p>Wrinkling, Puckering And Earing.</p> <p>Demonstrate different Components</p>
17	PRESS MACHINES	<ul style="list-style-type: none"> - Introduction - Specification - Classification - Types of presses - Power source, Frame, Driving mechanism, Slides 	<p>Tons, Manual, Fly, Bull, Mechanical, Hydraulic. " H", "C" frame. Drives Crank, Eccentric, Cam, Knuckle, Toggle, Screw, Rack & Pinion. Single, Double & Triple action.</p>
18		<ul style="list-style-type: none"> - Attachments for presses - Selection of a press - Feeding system – purpose, types, advantages 	<p>Roll feed, Hitch feed, De-Coiler. Push & Pull feed</p>

MOULD THEORY-I

SUBJECT CODE: DTDM-VS502

Learning goals for Mould Theory-I

On completion of this subject, the trainees will be able to:

- Know how to differentiate Thermoplastic and Thermo set moulding methods.
- Identify the working process of Blow moulding and applications.
- Identify Extrusion moulding working process and applications.
- Identify Rotational moulding, working process and applications.
- Identify working process of Thermo forming, types, and applications.
- Identify Calendaring working process and applications.
- List out the material of Core & Cavity, effects of alloying elements & treatment.
- Know the definition of an injection mould. Advantages & Disadvantages of injection mould.
- Know the function of an injection mould and their classification.
- Know the construction of various elements of an injection mould.
- Know the importance of feed system and balancing the same.
- Know the classifications of Runners, Gates with their typical applications.
- Know the importance and type of Ejector elements.
- Know the functions and applications of Pin, Stepped pin, 'D' shape, Blade, Stripper plate, Sleeve and Air ejectors.
- Factors influencing as well as considerations in cooling.
- Classification and typical applications of different cooling methods.
- Importance of Flat, Non-flat, stepped, local stepped, Angled, Complex surface.
- Balancing of mould surface.
- The importance of providing vents in an injection mould.
- The importance of providing Shrinkages in an injection mould.

MOULD THEORY-I

Contact Hours /Week: 3

Contact Hours / Semester: 64

SPECIFIC INSTRUCTIONAL OBJECTIVES:

1. INTRODUCTION

- Definition of mould

2. TYPES

- Construction, Working process of Thermoplastic and Thermo set moulding methods
- Thermoplastic moulding methods
- Injection moulding
- Blow moulding
- Extrusion moulding
- Thermo forming
- Rotational moulding
- Calendaring

3. INJECTION MOULD

- Introduction
- Definition of injection mould
- Advantages & Disadvantages of injection mould

4. TYPES OF INJECTION MOULD

- Two Plate Mould
- Three Plate Mould
- Hot Runner Mould
- Insulated Runner Mould
- Stacked Mould

5. MOULD CONSTRUCTION

- Introduction
- The various Parts Associated with working of injection mould
- Function of injection mould
- Classification of injection mould
- Construction of various parts of injection mould

6. FEED SYSTEM

- Types of Runners (Full round, half round, Square, Trapezoidal, Modified Trapezoidal)
- Typical Applications
- Type and classification of Gates
- Manually trimmed gates (Edge, Ring, Tab, Direct Sprue, Spoke, Disk,)
- Automatically trimmed gates (Pin point and Submarine)
- Typical Applications

7. EJECTION

- Importance of Ejection
- Types (Pin, Stepped pin, 'D' shape, Blade, Stripper plate, Sleeve, Air)
- Typical Applications

8. TEMPERATURE CONTROL SYSTEM

- Factors influencing the cooling
- Cooling considerations
- Types (Parallel, 'U' type, Baffle, Stepped, Angle hole, Thermal pin, Bubbler, Annular)
- Typical Applications

9. PARTING SURFACE

- Introduction
- Classification (Flat, Non-flat, Stepped, Local stepped, Angled, Complex)
- Balancing of mould surface
- Typical Applications
- Importance and applications of Air Vents

10. SHRINKAGE

- Introduction
- Why does shrinkage occur?
- Problems caused by the shrinkage
- Cavity dimension calculations

WEEK WISE SYLLABUS FOR MOULD THEORY – I

Week No.	Chapter	Learning Goals
1-2	a. Introduction to Moulding b. Mould Making methods	-Thermoplastic & Thermosetting Plastics. - Application Examples of Plastic components. - General Concept of Mould & Manufacturing Methods - Moulding Process & Moulding Machines
3-4	Thermoplastic processing methods a. Blow Moulding b. Extrusion Moulding c. Rotational Moulding d. Calendaring e. Thermoforming	- Definition, Construction, Working Process. - Types and Suitable Typical Applications.
5-6		- Thermo Plastics, Definition of Injection Mould, Moulding Machine, Working Process. - Definition, Working Cycle: Variables – Mould, Machine, Design, Material - Advantages & Dis-Advantages of an Injection Mould
7-8	Definition of an injection mould Advantages & Disadvantages of an injection mould. Types of an injection mould Two Plate Mould Three Plate Mould Hot Runner Mould Insulated Runner Mould Stacked Mould	
9-10	-Feed system - Different types of Runners and gates	- Types of Runners (Full round, half round, Square, Trapezoidal, Modified Trapezoidal) - Manually trimmed gates (Edge, Ring, Tab, Direct Sprue, Spoke, Disk,) - Automatically trimmed gates (Pin point and Submarine) - Typical Applications

11	Unit Test - 1	
12-13	Ejection	<ul style="list-style-type: none"> - Importance of Ejection - Types (Pin, Stepped pin, 'D' shape, Blade, Stripper plate, Sleeve, Air) - Typical Applications
14-15	Temperature control system	<ul style="list-style-type: none"> - Factors influencing the cooling - Cooling considerations - Types (Parallel, 'U' type, Baffle, Stepped, Angle hole, Thermal pin, Bubbler, Annular) - Typical Applications
16-17	Parting surface	<ul style="list-style-type: none"> - Introduction - How to select - Classification (Flat, Non-flat, Stepped, Local stepped, Angled, Complex) - Balancing of mould surface - Typical Applications - Importance and applications of Air Vents
18	Shrinkage	<ul style="list-style-type: none"> -Introduction -Why does shrinkage occur? -Problems caused by the shrinkage -Cavity dimension calculations
19	Unit Test - 2	

Learning goals for Press Tool Design-1

On completion of this subject, the trainees will be able to:

- Prepare a strip lay-out & calculate material utilization
- Calculate centre of pressure graphically
- Calculate thickness of die plate.
- Calculations tool elements size & thickness.
- Design of Die lay-out with '0' line dimensions
- Design a blanking tool assembly, part list & detail drawings
- Design progressive blanking tool assembly & calculations of tool elements size & thickness.
- Design progressive tool with Fixed type & Floating type strippers
- Design progressive tool with Cut off & Part off operations
- Design compound tool assembly in three views

PRESS TOOL DESIGN -I

Contact Hrs. /Week: 4

Contact Hrs. / Semester: 80

SPECIFIC INSTRUCTIONAL OBJECTIVES:

1. INTRODUCTION TO PRESS TOOL DESIGN & ANALYSES CONCEPT

- Type of Material
- Component Application
- Types of Press operations
- **Critical & General Dimension**
- Production Quantity
- Type of Press Tool required
- Strip Layout
- Die Layout
- Tool Elements Layout
- Assembly Plan view
- Assembly Sectioned Front View
- Assembly Full/ Partial Side view
- Bill of Material & its contents
- Planning of GTTC Standard Layout on A1 Sheet
- 1st Angle Projection

2. STRIP LAY OUT

- Structure of Strip Layout
- Blank Layout [Single Row, Multi Rows, Single Pass, Double Pass]
- Utilization of sheet material Calculation
- Required tonnage Calculation

3. DIE LAY OUT

- Top view, Sectioned Front view, Sectioned Side View, Partial Enlarged Views.
- Die openings & Holes Projections.
- Die block Length, width & Thickness Calculations.
- Dimensioning [Co-ordinate, Centralized]
- Geometrical Symbols
- Sub Title Block
- Centre of pressure (COP) Graphically & Algebraic Calculation
- Calculations of Plate Thickness.

PRESS TOOL DESIGN -I

4. SINGLE STAGE, SINGLE ROW BLANKING TOOL (OPEN TOOL CONSTRUCTION)

- Calculation of size of tool elements
- Blank Layout
- Assembly Plan view
- Assembly Sectioned Front View
- Assembly Side view
- Bill of Material
- Detail Part Drawings

5. SINGLE STAGE , SINGLE ROW ANGULAR LAYOUT BLANKING TOOL (WITH DIAGONAL PILLAR DIE SET) FRONT FEEDING

- Calculation of size of tool elements
- Blank Layout
- Assembly Plan view
- Assembly Sectioned Front View
- Assembly Side view
- Bill of Material
- Detail Part Drawings

6. SINGLE STAGE , DOUBLE ROW BLANKING TOOL (WITH REAR PILLAR DIE SET) SIDE FEEDING

- Calculation of size of tool elements
- Blank Layout
- Assembly Plan view
- Assembly Sectioned Front View
- Assembly Side view
- Bill of Material
- Detail Part Drawings

7. SECONDARY OPERATIONAL TOOLS WITH DIE NESTING , PIERCING TOOL (WITH CENTRE PILLAR DIE SET)

- Calculation of size of tool elements
- Assembly Plan view
- Assembly Sectioned Front View
- Assembly Side view
- Bill of Material
- Detail Part Drawings

PRESS TOOL DESIGN -I

4. TWO STAGES PROGRESSIVE CUTTING TOOL WITH STAGE STOPPER (WITH REAR PILLAR DIE SET)

- Calculation of size of tool elements
- Economical Strip Layout
- Assembly Plan view
- Assembly Sectioned Front View
- Assembly Side view
- Bill of Material
- Detail Part Drawings

5. THREE / FOUR STAGES PROGRESSIVE CUTTING TOOL WITH PITCH PUNCH & PILOTS ON A REAR PILLAR DIE SET

- Calculation of size of tool elements
- Economical Strip Layout
- Assembly Plan view
- Assembly Sectioned Front View
- Assembly Side view
- Bill of Material
- Detail Part Drawings

6. PROGRESSIVE CUTTING TOOL WITH CUT-OFF ARRANGEMENT ON A FOUR PILLAR DIE SET

- Calculation of size of tool elements
- Economical Strip Layout
- Assembly Plan view
- Assembly Sectioned Front View
- Assembly Side view
- Bill of Material
- Detail Part Drawings

7. PROGRESSIVE CUTTING TOOL WITH PART-OFF ARRANGEMENT ON A DIAGONAL PILLAR DIE SET

- Calculation of size of tool elements
- Economical Strip Layout
- Assembly Plan view
- Assembly Sectioned Front View
- Assembly Side view
- Bill of Material
- Detail Part Drawings

PRESS TOOL DESIGN -I

8. PROGRESSIVE CUTTING TOOL WITH FLOATING STRIPPER ON A REAR PILLAR DIE SET

- Calculation of size of tool elements
- Economical Strip Layout
- Assembly Plan view
- Assembly Sectioned Front View
- Assembly Side view
- Bill of Material
- Detail Part Drawings

9. COMPOUND TOOL FOR WASHER

- Calculation of size of tool elements
- Assembly Plan view
- Assembly Sectioned Front View
- Assembly Side view
- Bill of Material
- Detail Part Drawings

10. COMPOUND TOOL FOR NON CIRCULAR COMPONENTS

- Calculation of size of tool elements
- Assembly Plan view
- Assembly Sectioned Front View
- Assembly Side view
- Bill of Material
- Detail Part Drawings

11. SINGLE STAGE BLANKING TOOL WITH REAR PILLAR DIE SET COMPOUND TOOL FIVE STAGES PROGRESSIVE CUTTING TOOL WITH FLOATING STRIPPER & FOUR PILLAR DIE SET

- Calculation of size of tool elements
- Economical Strip Layout
- Assembly Plan view
- Assembly Sectioned Front View
- Assembly Side view
- Bill of Material
- Detail Part Drawings

WEEKLY PLAN FOR PRESS TOOL DESIGN-I

WEEK No.	CHAPTER	TOPICS	ACTIVITY
1	Introduction to Press Tool Design & Analyses Concept	1. COMPONENT ANALYSES - Type of Material - Component Application - Types of Press operations - Critical & General Dimension - Production Quantity - Type of Press Tool required 2. DESIGN ANALYSES - Strip Layout - Die Layout - Tool Elements Layout - Assembly Plan view - Assembly Sectioned Front View - Assembly Full/ Partial Side view - Bill of Material & its contents - Planning of GTTC Standard Layout on A1 Sheet - 1 st Angle Projection	✓ Ask students to get different sheet metal Components before commencement of the Design Classes. ✓ Collect Single & Progressive stage Punched Strips. ✓ Display Single Stage, Progressive Stage & Compound Stage model Tools present in your centre.
2 & 3	Strip lay out	- Structure of Strip Layout - Blank Layout [Single Row, Multi Rows, Single Pass, Double Pass] - Utilization of sheet material - Calculation - Required tonnage Calculation	Design Strip Layouts for 10 different Components
4 & 5	Die lay out	- Top view, Sectioned Front view, Sectioned Side view, Partial Enlarged Views. - Die openings & Holes Projections. - Die block Length, width & Thickness Calculations. - Dimensioning [Co-ordinate, Centralized] - Geometrical Symbols - Sub Title Block - Centre of pressure (COP) Graphically & Algebraic Calculation - Calculations of Plate Thickness.	Design Strip Layouts & Die Layouts for 06 different Components
6	Single Stage, Single Row Blanking Tool (Open Tool Construction)	- Calculation of size of tool elements - Blank Layout - Assembly Plan view - Assembly Sectioned Front View - Assembly Side view - Bill of Material - Detail Part Drawings	Create the Importance & Awareness about Punch; Fixed Stripper & Die block alignments. 2 Components
7	Single Stage , Single Row Angular Layout Blanking Tool (With Diagonal Pillar Die Set) Front Feeding	- Calculation of size of tool elements - Blank Layout - Assembly Plan view - Assembly Sectioned Front View - Assembly Side view - Bill of Material - Detail Part Drawings	Create the Importance & Awareness about Economical Strip Utilization during angular layouts, Positions of Punch with reference to Die opening & Importance of Die Set 2 Components
8	Single Stage , Double Row Blanking Tool (With Rear Pillar Die Set) Side Feeding	- Calculation of size of tool elements - Blank Layout - Assembly Plan view - Assembly Sectioned Front View - Assembly Side view - Bill of Material - Detail Part Drawings	Create the Importance & Awareness of Strip Utilization factor & Need for Double Row in Small Components & Huge requirements 2 Components
9	Secondary Operational Tools with Die Nesting, Piercing Tool (With Centre Pillar Die Set)	- Calculation of size of tool elements - Assembly Plan view - Assembly Sectioned Front View - Assembly Side view - Bill of Material - Detail Part Drawings	Create the Importance & Awareness of Secondary Operational Tools & Nesting Concept (Plate type, Pin type) 2 Components

WEEKLY PLAN FOR PRESS TOOL DESIGN-I			
10	Two Stages Progressive Cutting Tool with Stage Stopper (With Rear Pillar Die Set)	<ul style="list-style-type: none"> - Calculation of size of tool elements - Economical Strip Layout - Assembly Plan view - Assembly Sectioned Front View - Assembly Side view - Bill of Material - Detail Part Drawings 	Create the Importance & Awareness of Pitch, & Opening Alignments of Punch Holder, Stripper plate & Die Block to the students. 2 Components
11	Three / Four Stages Progressive Cutting Tool with Pitch Punch & Pilots on a Rear Pillar Die Set	<ul style="list-style-type: none"> - Calculation of size of tool elements - Economical Strip Layout - Assembly Plan view - Assembly Sectioned Front View - Assembly Side view - Bill of Material - Detail Part Drawings 	Create Awareness of Pitch Punch (Notching Group, Heeled construction) and Pilots Shape Size & Application 2 Components
12 & 13	Progressive Cutting Tool with Cut-off Arrangement on a Four Pillar Die Set	<ul style="list-style-type: none"> - Calculation of size of tool elements - Economical Strip Layout - Assembly Plan view - Assembly Sectioned Front View - Assembly Side view - Bill of Material - Detail Part Drawings 	Create the Importance & Awareness Cut-off design & its construction. 2 Components
14 & 15	Progressive Cutting Tool with Part-off Arrangement on a diagonal Pillar Die Set	<ul style="list-style-type: none"> - Calculation of size of tool elements - Economical Strip Layout - Assembly Plan view - Assembly Sectioned Front View - Assembly Side view - Bill of Material - Detail Part Drawings 	Create the Importance & Awareness Part-off design & its construction. 2 Components
16	Progressive Cutting Tool with Floating Stripper on a Rear Pillar Die Set	<ul style="list-style-type: none"> - Calculation of size of tool elements - Economical Strip Layout - Assembly Plan view - Assembly Sectioned Front View - Assembly Side view - Bill of Material - Detail Part Drawings 	Create the Importance & Awareness Floating Stripper & its purpose. (Clamping type & Non Clamping type) 2 Components
17	Compound Tool for Washer	<ul style="list-style-type: none"> - Calculation of size of tool elements - Assembly Plan view - Assembly Sectioned Front View - Assembly Side view - Bill of Material - Detail Part Drawings 	Create the Importance & Awareness of Compound Tool & highlight types of Components produced in this Tool
18	Compound Tool for Non Circular Components	<ul style="list-style-type: none"> - Calculation of size of tool elements - Assembly Plan view - Assembly Sectioned Front View - Assembly Side view - Bill of Material - Detail Part Drawings 	----
DESIGN HANDS ON SOFTWARE			
19 to 22	<ol style="list-style-type: none"> 1. Single Stage Blanking tool with Rear Pillar Die Set (4 hrs) 2. Compound Tool (4 hrs) 3. Five Stages Progressive Cutting Tool With Floating Stripper & four Pillar Die set (8 hrs) 	<ul style="list-style-type: none"> - Calculation of size of tool elements - Economical Strip Layout - Assembly Plan view - Assembly Sectioned Front View - Assembly Side view - Bill of Material - Detail Part Drawings 	Designing to be done using Software's



MOULD DESIGN-I

SUBJECT CODE: DTDM-VS505

Contact Hrs. /Week: 4

Contact Hrs. / Semester: 94

Learning goals for Mould Design-1

On completion of this subject, the trainees will be able to:

- Designing of concept an Assembly Two Plate Mould as per GTTC Standards.
- Designing methods for simple thermo plastic Components.
- Shrinkage calculation and their importance for core cavity dimensioning.
- Core and cavity Design concept for simple components.
- Design concept for simple two plate injection mould.
- Understands the importance of Core & cavity alignment/ manufacturing concept.
- Understands the placement of multiple impressions in an injection mould.
- Understands how to select/ extract suitable mould base within GTTC standards.
- Understands the significance of designing a single cavity mould. (Direct sprue gate)
- Understands the importance of adopting different ejection methods.
- Select various cooling methods for individual moulds.
- Choose/ select different parting surfaces.
- Importance of Providing Shrinkage Allowance

MOULD DESIGN-I

SUBJECT CODE: DTDM-VS505

SYLLABUS FOR MOULD DESIGN – I

WEEK No.	DESIGN CONCEPT	OBJECTIVES
1 & 2	Design of a Single Cavity Hand Mould with Edge Gate, & Round runner & Plate Ejection.	<ul style="list-style-type: none"> a. Parting Line Selection b. Alignment of Core & Cavity c. Ejection d. All Parts Drawing with suitable dimensioning method e. Dimensioning Core & Cavity with Shrinkage Values
3 & 4	Design of a Standard Two Plate Mould PARTS as per GTTC Standards for Mould Set No1	<ul style="list-style-type: none"> a. List out parts of a Two Plate Mould b. Draw to 1:1 scale, individual parts with respect to Dimensions for Mould Set No. 1 c. Dimensioning Methods Selection d. Fits & Tolerances
5	Design of an Assembly Two Plate Mould as per GTTC Standards for Mould Set No1.	<ul style="list-style-type: none"> a. Introduction b. Fixed Half & Moving Half c. Top View / Plan View d. Selection of Section Plane e. Sectional Front View as per Section Plane f. Dimensioning Top View & Front View, plate Thickness, Pitches and Shut Height. g. Ballooning & Parts Numbering h. Part List to Standard Practice
6	Design of an Assembly Two Plate Mould as per GTTC Standards with Stripper Plate Ejection for Mould Set No-1.	<ul style="list-style-type: none"> a. Introduction – Direct Sprue, Spoke Gate, Stripper Ejection – Size, location. b. Parting surface selection, Design of Core & Cavity, Dimensioning with Shrinkage, Fits & Tolerances c. Mould Size selection d. Annular Cooling for Cavity, Baffle Cooling for Core, 'O' Rings e. Top View / Plan View f. Selection of Section Plane g. Sectional Front View as per Section Plane h. Side view - Missing Views, Partial Sectioning. i. Dimensioning Top View & Front View, plate Thickness, Pitches and Shut Height j. Ballooning & Parts Numbering k. Part List to Standard Practice
7 & 8	Design of an SINGLE Cavity Two Plate Length Bolt Actuation, Stripper Ejection Mould as per GTTC Standards for Mould Set No. 2 . SAME COMPONENT AS ABOVE	<ul style="list-style-type: none"> a. Introduction – Direct Sprue Gate, Stripper Ejection – Length Bolt Actuation. Size, location. b. Mould Size selection c. Annular Cooling for Cavity, Baffle Cooling for Core, 'O' Rings d. Top View / Plan View e. Selection of Section Plane f. Sectional Front View as per Section Plane g. Side view - Missing Views, Partial Sectioning. h. Dimensioning Top View & Front View, plate Thickness, Pitches and Shut Height i. Ballooning & Parts Numbering j. Part List to Standard Practice

9 & 10	Design of a Single Cavity Injection Mould with Sprue Gate for Pin Ejection.	<ul style="list-style-type: none"> a. Parting Line Selection b. Alignment of Core & Cavity c. Ejection d. All Parts Drawing with suitable dimensioning method e. Dimensioning of Core & Cavity with Shrinkage Values
11&12	Design of a Two Cavity, Two Plate, Injection Mould as per GTTC Standards	<ul style="list-style-type: none"> a. Introduction - Edge Gate, Round Runner, Pin Ejection – Size, location. b. Local Stepped Parting surface selection, Design of Core & Cavity, Dimensioning with Shrinkage, Fits & Tolerances c. Mould Size selection d. Annular Cooling for Cavity, Baffle Cooling for Core, 'O' Rings e. Top View / Plan View f. Selection of Section Plane g. Sectional Front View as per Section Plane h. Side view - Missing Views, Partial Sectioning. i. Dimensioning Top View & Front View, plate Thickness, Pitches and Shut Height j. Ballooning & Parts Numbering k. Part List to Standard Practice
13	TEST - I	
14&15	Design of a Two Cavity, Two Plate, Injection Mould as per GTTC Standards	<ul style="list-style-type: none"> a. Introduction – Fan Gate, Round Runner, Pin Ejection – Size, location. b. Parting surface selection, Design of Core & Cavity, Dimensioning with Shrinkage, Fits & Tolerances c. Mould Size selection d. Annular Cooling for Cavity, Baffle Cooling for Core, 'O' Rings e. Top View / Plan View f. Selection of Section Plane g. Sectional Front View as per Section Plane h. Side view - Missing Views, Partial Sectioning. i. Dimensioning Top View & Front View, plate Thickness, Pitches and Shut Height j. Ballooning & Parts Numbering k. Part List to Standard Practice
16&17	Design of a Two Cavity, Two Plate, Injection Mould as per GTTC Standards	<ul style="list-style-type: none"> a. Introduction – Submarine Gate, Round Runner, Sleeve Ejection – Size, location. b. Parting surface selection, Design of Core & Cavity, Dimensioning with Shrinkage, Fits & Tolerances c. Mould Size selection d. Annular Cooling for Cavity, Bubbler Cooling for Core, 'O' Rings e. Top View / Plan View f. Selection of Section Plane g. Sectional Front View as per Section Plane h. Side view - Missing Views, Partial Sectioning. i. Dimensioning Top View & Front View, plate Thickness, Pitches and Shut Height j. Ballooning & Parts Numbering k. Part List to Standard Practice
18	TEST - II	

19&20	Design of a Two Cavity, Two Plate, Injection Mould as per GTTC Standards	<ul style="list-style-type: none"> a. Introduction – Submarine Gate, Round Runner, Blade Ejection – Size, location. b. Stepped Parting surface selection, Design of Core & Cavity, Dimensioning with Shrinkage, Fits & Tolerances c. Mould Size selection d. Parallel / 'U' Circuit Cooling for Cavity & Core, 'O' Rings e. Top View / Plan View f. Selection of Section Plane g. Sectional Front View as per Section Plane h. Sectional Side view. i. Dimensioning Top View & Front View, plate Thickness, Pitches and Shut Height j. Ballooning & Parts Numbering Part List to Standard Practice
21&22	Design of a Four Cavity, Two Plate, Injection Mould as per GTTC Standards COMPONENT SELECTION BY TRAINEE	<ul style="list-style-type: none"> a. Introduction – Submarine Gate, Modified Trapezoidal Runner, Blade Ejection – Size, location. b. Stepped Parting surface selection, Design of Core & Cavity, Dimensioning with Shrinkage, Fits & Tolerances c. Mould Size selection d. Parallel / 'U' Circuit Cooling for Cavity & Core, 'O' Rings e. Top View / Plan View f. Selection of Section Plane g. Sectional Front View as per Section Plane h. Sectional Side view. i. Dimensioning Top View & Front View, plate Thickness, Pitches and Shut Height j. Ballooning & Parts Numbering Part List to Standard Practice
23	COMPONENT SELECTION BY TRAINEE	SUITABLE SELECTION OF PARTING SURFACE, COOLING & EJECTION TECHNIQUES
24	SEMESTER EXAMINATION	



MECHATRONICS

SUBJECT CODE: DTDM-VS503

Contact Hrs. /Week: 3

Contact Hrs. / Semester: 64

Learning goals for MECHATRONICS

On completion of this subject, the trainees will be able to:

- Scope of Mechatronics
- Sensors & Transducers
- Electrical actuation systems
- Microprocessor systems and its applications
- Advanced Manufacturing systems
- Programmable Logic Controllers
- Overview of robots



MECHATRONICS

SUBJECT CODE: DTDM-VS503

Contact Hrs. /Week: 2

Contact Hrs. / Semester: 64

SPECIFIC INSTRUCTIONAL OBJECTIVES

1. INTRODUCTION

- What is Mechatronics?
- Scope of Mechatronics
- Key Issues
- Systems
- Measurement systems
- Control Systems
- Microprocessor based controller
- Response of a system
- Mechatronics approach

2. SENSORS & TRANSDUCERS

- Sensors & Transducers
- Performance terminology
- Displacement, position, & Proximity
- Velocity and motion
- Force
- Fluid pressure
- Liquid flow
- Liquid levels
- Light sensors
- Selection of sensors
- Data i/p using switches

3. ELECTRICAL ACTUATION SYSTEMS

- Electrical systems: Relays
- Solid state switches
- Solenoid

4. MICROPROCESSORS

- Control
- Microprocessor systems
- Microcontrollers
- Applications
- Programming

MECHATRONICS

5. INTRODUCTION TO MODERN CNC MACHINE & MANUFACTURING SYSTEMS

- Introduction
- Advantages of CNC Machines
- CNC Machining centre developments
- Turning centre developments
- Tool monitoring on CNC Machines
- Other CNC developments
- Advanced Manufacturing systems
- Benefits of FMS
- Trends in adoption of FMS

6. PROGRAMMABLE LOGIC CONTROLLERS

- Programmable Logic Controllers
- Basic structures
- I/O Processing
- Programming

7. Robots & Other Motion Control Systems

- Overview of robots
- Types of robots
- Types of robot controls
- Types of robot programs
- Basic parts of robot systems
- Other types of robot actuators
- I/O signals for robots
- I/O circuits for robot signals
- I/O modules
- Robots in typical work and manufacturing cells

Text Books

1. MECHATRONICS, Bolton, Pearson Publication [LPE]
2. MECHATRONICS, HMT Ltd., TMH Publication
3. Industrial Electronics, Kissel

WEEKLY PLAN FOR MECHATRONICS		
WEEK NO	CHAPTER TITLE	CONTENTS OF TOPICS
1-2	INTRODUCTION	What is Mechatronics? Scope of Mechatronics Key Issues Systems Measurement systems
		Control Systems Microprocessor based controller Response of a system Mechatronics approach
3-6	SENSORS & TRANSDUCERS	Sensors & Transducers Performance terminology Displacement, position, & Proximity
		Velocity and motion Force Fluid Pressure
		Liquid flow Liquid levels
		Light sensors Selection of sensors Data i/p using switches
7-8	ELECTRICAL ACTUATION SYSTEMS	Electrical systems: Relays Solid state switches Solenoid
10-11	MICROPROCESSORS	Control Microprocessor systems Microcontrollers Applications Programming
12-14	INTRODUCTION TO MODERN CNC MACHINE & MANUFACTURING SYSTEMS	Introduction Advantages of CNC Machines CNC Machining centre developments
		Turning centre developments Tool monitoring on CNC Machine Other CNC developments
		Advanced Manufacturing systems Benefits of FMS Trends in adoption of FMS

15-16	PROGRAMMABLE LOGIC CONTROLLERS	Programmable Logic Controllers Basic structures I/O Processing Programming
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WEEKLY PLAN FOR MECHATRONICS		
WEEK NO	CHAPTER TITLE	CONTENTS OF TOPICS
17-20	ROBOTS & OTHER MOTION CONTROL SYSTEMS	Overview of robots Types of robots
		Types of robot controls Types of robot programs
		Basic parts of robot systems Other types of robot actuators
		I/O signals for robots I/O circuits for robot signals
		I/O modules Robots in typical work and manufacturing cells