



**Lok Jagruti Kendra University**  
University with a Difference

**Diploma  
in  
Mechanical Engineering**



**Course Code: 025060604**

**Tool Design**

<b>Programme / Branch Name</b>			Diploma in Mechanical Engineering			
<b>Course Name</b>	Tool Design			<b>Course Code</b>	025060604	
<b>Course Type</b>	HSSC	BSC	ESC	PCC	OEC	PEC

**Legends:** HSSC: Humanities and Social Sciences Courses      BSC: Basic Science Courses  
 ESC: Engineering Science Courses      PCC: Program Core Courses  
 OEC: Open Elective Courses      PEC: Program Elective Courses

## 1. Teaching and Evaluation Scheme

Teaching Hours / Week				Evaluation Scheme			
L	T	P	Total Credit	CCE	SEE (Th)	SEE (Pr)	TOTAL
3	0	2	4	50	50	50	150

**Legends:**  
 L: Lectures      T: Tutorial      P: Practical  
 CCE: Continuous & Comprehensive Evaluation  
 SEE (Th): Semester End Evaluation (Theory)  
 SEE (Pr): Semester End Evaluation (Practical)

## 2. Prerequisites

- ✓ Engineering Graphics
- ✓ Material Science
- ✓ Machine Tools & Techniques
- ✓ Metrology & Measurements
- ✓ Workshop Practices

## 3. Rationale

To establish the synchronization between Industry & Institution, Tool Design is one of the subject to deal with it. In industries it is necessary to achieve Quality & Quantity, at the same time the economical consideration is very important criteria too. In such scenario selection of different tools plays vital role. The detail understanding of Tool Design will lead to achieve such competencies & skilled employment for industry.

## 4. Objectives

- ✓ To understand the importance of Tool Design & its consideration for industry.
- ✓ To achieve quality & quantity in industry Degree of Freedom plays important role & such fundamental concept is need to understand.
- ✓ To get in depth knowledge of different locating & clamping devices to restrict movements & vibrations during production process.
- ✓ Selection & designing of proper tools such as Jigs, Fixtures & its elements for economical production.
- ✓ To impart the knowledge of Press tool components, construction & working.
- ✓ Design & develop different types of punch & Die for accuracy & bulk production.

## 5. Contents

Unit No.	Topics	Sub-Topics	Learning Outcome	% Weightage	Hours
1.	Introduction of Tool Design	1.1 Definition of Tool, Tool Design, Tool Engineering 1.2 Classification of Tool 1.3 Concept of Tool Design 1.3.1 Objective 1.3.2 Design Principles 1.3.3 Design Consideration 1.4 Concept & Importance of Tool Engineering	<ul style="list-style-type: none"> <li>To understand the importance of Tool Design &amp; Tool Engineer</li> </ul>	5	4
2.	Locating & Clamping Devices	2.1 Degree of Freedom 2.2 Principle of Location 2.3 Locating Devices 2.3.1 Definition of Locator 2.3.2 Types, Construction, Working & Application of Locators 2.4 Clamping Devices 2.4.1 Definition of Clamping 2.4.2 Types, Construction, Working & Application of Clamping Devices	<ul style="list-style-type: none"> <li>Types of Degree of Freedom &amp; method to restrict the movements of work-piece</li> <li>Application of different devices to restrict the movements &amp; vibrations</li> </ul>	20	6
3.	Jigs & Fixtures	3.1 Introduction 3.1.1 Definition of Jig & Fixture 3.1.2 Importance of Jig & Fixture 3.1.3 Function, Material, Advantages & Disadvantages 3.2 Elements of Jigs & Fixtures 3.3 Types of Jig Bush 3.4 Jigs 3.4.1 Types, Construction & Applications of Jigs 3.4.2 Design of Jig 3.5 Fixtures 3.5.1 Types, Construction & Applications of Fixtures 3.5.2 Design of Fixtures	<ul style="list-style-type: none"> <li>Understand the methods &amp; applications of different tools to increase accuracy &amp; mass production</li> <li>Process of designing Jigs &amp; Fixtures</li> </ul>	25	10
4.	Press Tool	4.1 Introduction of Press 4.1.1 Definition of Press, Press Tool & Sheet Material 4.1.2 Classification of Press 4.1.3 Construction & Working of Press Components 4.2 Basic Terminologies 4.2.1 Center of Pressure 4.2.2 Tonnage Capacity	<ul style="list-style-type: none"> <li>Understand the basic concept &amp; working of Press Tool</li> </ul>	25	12

		<p>4.2.3 Shut Height of Press 4.2.4 Shear action in Press 4.2.5 Die Clearance &amp; its effects</p> <p>4.3 Press Tools Cutting Operations 4.3.1 Concept 4.3.2 Classification of Cutting Operations</p> <p>4.4 Press Tools Non-Cutting Operations 4.4.1 Concept 4.4.2 Classification of Non-Cutting Operations 4.4.3 Concept of Banding Operation 4.4.4 Concept of Drawing Operation 4.4.5 Concept of Forming Operation</p> <p>4.5 Types of Dies 4.5.1 Simple Die 4.5.2 Compound Die 4.5.3 Combination Die 4.5.4 Progressive Die</p>	<ul style="list-style-type: none"> <li>• Understanding the basic terminologies for designing of Press Tools</li> <li>• Types of Press Tool Operations, Dies &amp; its Applications</li> </ul>		
5.	Design of Press Tool	<p>5.1 Basic Terminologies 5.1.1 Shear Force 5.1.2 Shear Angle</p> <p>5.2 Design &amp; Calculation of Tonnage Capacity</p> <p>5.3 Design &amp; Calculation of Center of Pressure</p> <p>5.4 Design &amp; Calculation of Scrap Strip Layout 5.4.1 Concept, Importance, Methods &amp; Types 5.4.2 Concept &amp; Types of Piloting &amp; Stopping 5.4.3 Design &amp; Calculation of Percentage Utilization of Material</p> <p>5.5 Design of Punch &amp; Die 5.5.1 Compound Die 5.5.2 Progressive Die</p>	<ul style="list-style-type: none"> <li>• Understand the importance of usage of material &amp; ways to reduce the scrape</li> <li>• Design &amp; calculations of Punch &amp; Die for Press Tools</li> </ul>	25	10

**Total Hours**      **42**



## 6. List of Practicals / Exercises

The practicals/exercises have been properly designed and implemented in an attempt to develop different types of skills, so that students can acquire the competencies/programme outcomes. Following is the list of practicals/exercises.

Sr. No	Practical / Exercises	Key Competency	Hours
1.	Design & Develop actual or model of Jig, Fixture & Punch-Die Set.	Working & Construction of different tools	4
2.	Design a suitable Jig for the given component with the considerations of steps & criteria of design. <ul style="list-style-type: none"> <li>• Design of Jig Bush</li> <li>• Design of Jig Plate/ Jig Body</li> <li>• Design of Locator</li> <li>• Design of Clamping Device</li> <li>• Assembly of Jig</li> </ul>	Types of Jigs & its elements	6
3.	Design a suitable Fixture for the given component with the considerations of steps & criteria of design. <ul style="list-style-type: none"> <li>• Design of Base</li> <li>• Design of T-Bolt</li> <li>• Design of Locator</li> <li>• Design of Clamping Device</li> <li>• Design of Setting Block</li> <li>• Assembly of Fixture</li> </ul>	Types of Fixtures & its elements	6
4.	Design & Calculate Tonnage Capacity & Center of Pressure for the given component.	Tonnage Capacity & Center of Pressure	2
5.	Design & Calculate Percentage Utilization & Scrap Strip Layout for the given component.	Scrap Strip Layout	2
6.	Design a suitable Compound or Progressive Die for the given component with the considerations of steps & criteria of design.	Types of Press operations & its elements	8

**Total Hours      28**

## 7. Suggested Specification Table for Evaluation Scheme

Unit No.	Unit Name	Distribution of Topics According to Bloom's Taxonomy					
		R %	U %	Ap %	C %	E %	An %
1.	Introduction of Tool Design	40	30	-	-	20	10
2.	Locating & Clamping Devices	20	30	30	-	10	10
3.	Jigs & Fixtures	5	10	25	30	5	25
4.	Press Tool	10	30	20	15	15	10
5.	Design of Press Tool	5	10	25	30	5	25

**Legends:** R: Remembering U: Understanding  
App: Applying C: Creating  
E: Evaluating An: Analyzing

## 8. Textbooks

- 1) Jigs and Fixtures by P.H. Joshi, Tata McGraw-Hill Education
- 2) Press Tool Design and Construction by P.H. Joshi, Wheeler Publishing

## 9. Reference Books

- 1) Tool Design by Cyril Donaldson, George H Lecain & V C Goold, Tata McGraw-Hill Education
- 2) Advance Die Making by Ostergaard, McGraw-Hill Book Company
- 3) P.C. Sharma, "A Text Book of Production Technology", S. Chand
- 4) Design Data Hand Book, Delhi Institute of Tool Engineering, Delhi

## 10. Open Sources (Website, Video, Movie)

- 1) <https://youtu.be/7yzvno4AvKw>
- 2) <https://youtu.be/vOo2MCYPsm4>
- 3) <https://youtu.be/W1JA5zHnowE>
- 4) <https://youtu.be/3I-7KRzJQBQ>
- 5) <https://youtu.be/ofx2rbBciyg>
- 6) <https://youtu.be/6azcOROhsSI>