

Lesson plans
Subject: Tool Design
Subject code: BPE05003
B. Tech. 5th Semester, Production Engineering
Faculty: Dr. Sudhansu Ranjan Das

Course Objectives: After successful completion of this course, students will able:

1. To illustrate the properties of various cutting tool materials and hence select an appropriate tool material for particular machining application
2. To Identify press tool requirements to build concepts pertaining to design of press tools
3. To Select suitable materials for different elements of press tools
4. To identify appropriate combination of tools, jigs and fixture, suitable for a particular machining operation
5. To design assembly of jigs and fixtures on simple workpiece

Lecture No.	Module	Content	Remark
1.	I	Introduction to Tool Design	
2.		Geometry of single-point cutting tools in ASA and ORS system	
3.		Design of single-point cutting tools: Tool strength and rigidity calculation	
4.		Selection of tool angles, chip breakers, High production cutting tools.	
5.		Problems on single point cutting tool i.e. Tool strength and rigidity calculation.	
6.		Problems on single point cutting tool related to tool geometry	
7.	II	Introduction to form tools, types of form tools, design of single-point cutting tools	
8.		Method of determining the profile of circular and flat form tool by analytical method	
9.		Method of determining the profile of circular and flat form tool by graphical method	
10.		Solving of problems on design of form tool by applying Graphical and analytical methods	
11.		Broaching, cutting process in broaching, geometric elements of broach tool	
12.		Design of internal & external surface broach, calculation of number of teeth for broach tool	
13.		Analysis of rigidity, cutting force, power for broaching	
14.		Solving problems on design of broach tool	
15.	III	Forging, forging allowances & equipment, forging operations	
16.		Design of a forging, forging design factors	
17.		Die design for drop and press forging	
18.		Die design for machine forging, Determination of stock size	
19.		Selection of forging equipment, Die inserts, tools for flash trimming and hole piercing	

20.		Solving problems related to forging design		
21.	IV	Press tool design: Sheet metal working operations		
22.		Sheet metal working equipment		
23.		Principle of metal cutting in Sheet metal working, Types of dies		
24.		Clearance, cutting forces, methods of reducing cutting forces		
25.		Minimum diameter of piercing, punch design, punch support, die block design		
26.		Stop, pilot stripper, knockout		
27.		Blanking die design and Piercing die design		
28.		Design of drawing die (Deep drawability, draw die radius, punch radius, draw clearance, drawing speed)		
29.		Design of drawing die (Calculation of blank size, number of draws, drawing pressure, blank holding pressure)		
30.		Progressive and compound die design		
31.		Problem solving and practice		
32.		V	Jigs and fixture, locating and clamping	
33.			Principle of location	
34.	Design principle for location purposes			
35.	Design principle for clamping purposes			
36.	Design principle for positioning purposes			
37.	Design principles common to jigs and fixtures			
38.	Drilling jigs, types of drilling jigs, design of drilling jig			
39.	Milling fixture, classification of milling fixture, design of milling fixture			
40.	Problem solving and practice			

Text Book(s):

1. Fundamental of tool Design- ASTME, PHI.
2. Metal cutting theory & cutting tool design- Arshinov.
3. A Text Book of Production Engineering- P.C. Sharma, S.Chand & Co.

Reference Book(s):

1. Tool Design- Donaldson, Le Cain &Goold, TMH.
2. Fundamental of tool Engineering Design- Basu, Mukherjee & Mishra, Oxford & IBH.

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

1. Interpret and understand the theory of metal cutting, tool life and geometry of single point and multipoint cutting tools
2. Understand principles of locating and clamping devices
3. Design jigs for drilling and fixtures for turning and milling
4. Select and design dies for piercing, blanking, bending and forming operations
5. Understand how to conduct machining economically