

**Unit I****Chapter 1 : Basics of Tool Engineering****1-1 to 1-21****Syllabus :**

- 1.1 Principles in tool engineering.
- 1.2 Mechanics of Metal cutting : Requirements of tools
- 1.3 Cutting forces - Merchant circle, types of chips, chip thickness ratio, shear angle.
Shear angle - concept, need and method to give shear angle on punch and die.
- 1.4 Types of metal cutting process - orthogonal, cutting.
- 1.5 Cutting tool geometry - Single point cutting tool

1.1	Introduction	1-1
1.1.1	Definition and Principles of Tool Engineering	1-3
1.2	Mechanics of Metal Cutting	1-3
1.3	Cutting Forces	1-5
1.3.1	Merchant Circle Diagram	1-7
1.3.2	Chips	1-10
1.3.2.1	Types of Chips	1-10
1.3.2.2	Comparison of types of chips conditions	1-12
1.3.3	Chip Thickness Ratio	1-12
1.3.4	Shear Angle	1-13
1.3.4.1	Methods to give shear angle on punch and die	1-13
1.4	Types of Metal Cutting Process	1-14
1.4.1	Orthogonal Cutting	1-15
1.4.2	Oblique Cutting	1-15
1.4.3	Difference between Orthogonal and Oblique Cutting	1-16
1.5	Cutting Tool Geometry - Single Point Cutting Tool	1-17

Unit II**Chapter 2 : Cutting Tool Materials and Holding Devices****2-1 to 2-22****Syllabus :**

- 2.1 Cutting tool materials-types, composition, properties and applications
- 2.2 Carbide inserts-types, ISO-designation and applications, other inserts like CBN and PCBN
- 2.3 Tool holders for turning, milling machines and CNC machines
- 2.4 ISO designations of Tool holders
- 2.5 Tool sharpening method for single point cutting tool.



2.1	Introduction	2-1
2.1.1	Desirable Properties of Cutting Tool Materials	2-1
2.1.2	Types of Cutting Tool Materials	2-2
2.2	Carbide Inserts	2-6
2.2.1	Types of Carbide Inserts	2-6
2.2.2	ISO Designation of carbide Inserts	2-7
2.2.3	CBN and PCBN Inserts.....	2-9
2.2.3.1	Cubic Boron Nitride (CBN).....	2-9
2.2.3.2	Poly Crystalline Cubic Boron Nitride (PCBN)	2-10
2.3	Tool Holders for Turning, Milling machines and CNC Machines.....	2-10
2.3.3	Tool Holder for CNC Machines	2-14
2.4	ISO Designation of Tool Holders.....	2-17
2.5	Tool Sharpening of Single Point Cutting Tool.....	2-21

Unit III

Chapter 3 : Locating and Clamping Devices

3-1 to 3-25

Syllabus :

- 3.1** Concept, Definition Locating and Clamping
- 3.2** Use of Locating and Clamping Principles on Shop Floor
- 3.3 Degrees of Freedom** : Concept and Importance
- 3.4 Locators** : Types, construction, working and applications.
- 3.5 Clamping Devices** : Types of construction, Working and application.
- 3.6** Fool proofing and ejecting techniques.

3.1	Concept, Definition Locating and Clamping	3-1
3.2	Use of Locating and Clamping Principles on Shop Floor	3-3
3.3	Degrees of Freedom : Concept and Importance	3-7
3.4	Locators.....	3-9
3.4.1	Types of Locators	3-9
3.5	Clamping Devices.....	3-15
3.5.1	Types of Clamping Devices	3-16
3.6	Fool Proofing and Ejecting Techniques.....	3-22
3.6.1	Fool proofing	3-22
3.6.2	Ejectors	3-24

**Unit IV****Chapter 4 : Jigs and Fixtures****4-1 to 4-24****Syllabus :**

- 4.1** Concept, definition of jigs and fixtures, Difference between jigs and fixtures.
4.2 Jigs - Types, construction, working and applications.
4.3 Fixtures - Types, construction, working and applications.
4.4 Design considerations and procedure for Jigs and Fixtures.

4.1	Introduction.....	4-1
4.1.1	Concept of Jig/Fixture	4-2
4.1.2	Definition of Jigs and Fixtures	4-3
4.1.3	Difference between Jigs and Fixtures	4-5
4.2	Types, Construction, Working and Applications of Jigs.....	4-6
4.2.1	Types of Jigs (Classification of Jigs)	4-6
4.2.2	Jig for Drilling Four Equispaced Through Radial Holes in a Ring	4-11
4.3	Types, Construction, Working and Applications of Fixtures	4-12
4.4	Design Considerations and Procedure for Jigs and Fixtures	4-20

Unit V**Chapter 5 : Press Tool Design****5-1 to 5-41****Syllabus :**

- 5.1 Press working processes**-types, sketches and Applications.
5.2 Press tools : types, working, components and their Functions.
5.3 Concept, meaning, definitions and calculations of press tonnage and shut height of press tool. Shear action in die cutting operation.
5.4 Centre of pressure : Concept, meaning, definition, Methods of finding and importance.
5.5 Die clearance : Concept, meaning, definition, Reasons, effects and methods of application.
5.6 Cutting force : Methods to calculate and methods of reducing.
5.7 Scrap strip layout : Concept, importance, method to prepare and determining percentage stock utilization.
5.8 Types, working and applications of stock stop, pilots, strippers and knockouts.
5.9 Cutting dies-types and applications.
5.10 Design of progressive cutting die : a) Sketch the component, b) Prepare scrap strip layout
c) Calculate tonnage d) Determine centre of pressure e) Determine dimensions of punches, die block and die shoe f) Prepare sketch of stripper plate g) General assembly sketch of punches arrangement, die block, die shoe and stripper plate.

5.1	Press Working Processes : Types, Sketches, Applications	5-1
5.1.1	Press Working Processes.....	5-2
5.2	Press Tools	5-10



5.3	Concept, Meaning, Definition and Calculation of Press Tonnage, Shut Height of Press Tools, Shear Action in Die Cutting Operation	5-14
5.4	Centre of Pressure : Concept, Meaning Definition, Method of Finding and Importance.....	5-18
5.5	Die Clearance : Concept, Meaning, Definition, Reasons, Effects and Method of Application	5-20
5.6	Cutting Force : Method to calculate and Method of Reducing	5-23
5.6.1	Methods of reducing cutting forces	5-25
5.7	Scrap Strip Layout : Concept, Importance, Method to prepare and Determining Percentage Stock Utilization	5-27
5.8	Types, Working and Applications of Stock Stops, Pilots, Strippers and Knockouts.....	5-29
5.9	Cutting dies - Types and Applications.....	5-33
5.10	Design of Progressive Cutting Die	5-37

Unit VI

Chapter 6 : Bending, Drawing and Forging Dies

6-1 to 6-26

Syllabus :

6.1 Bending dies :

- a) Types, parts and functions of bending die.
- b) Definition, calculations and factors affecting bend radii, bend allowance and spring back
- c) Method to compute bending pressure : Types, sketch, working and applications of bending dies.

6.2 Drawing dies : Types and method to determine blank size for drawing operation, Types, sketch, working and applications of drawing dies (embossing, curling, bulging, coining, swaging and hole flanging) .

6.3 Forging dies : Terminology, types, sketch, working and application.

6.1	Introduction	6-1
6.2	Bending Dies	6-2
6.2.1	Types of Bending Dies	6-3
6.2.2	Parts and Functions of Bending Die.....	6-5
6.2.3	Definition, Calculations and Factors affecting Bend radii, Bend Allowance, and Spring Back	6-6
6.2.4	Method to Compute Bending Pressure : Types, Sketch, working and application	6-8
6.2.5	U - bending and Channel Bending Dies	6-9
6.3	Drawing Dies	6-9
6.3.1	Types of Drawing Operation	6-10
6.3.2	Types, Sketches, Working and Application of Drawing Dies	6-14
6.4	Forging Dies	6-19
6.4.1	Types of Forging Dies	6-19

