

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: V

Subject Name: **Tool Engineering**

Sr. No.	Course Content	Hours
1.	Introduction: 1.1. Concept, meaning and definitions of various terminology used, including tool, tool design, tool engineering, etc. 1.2. Tool engineering-functions, services and assistance, organizational structure, intra and interrelationship in an organization. 1.3. Tool engineer - characteristics, duties, responsibilities and importance. 1.4. Common troubles, problems, and troubleshooting approaches used in tool engineering.	2
2.	Process Planning, Economy and Estimation in Tool Engineering: 2.1 Process planning-concept, meaning, , importance, functions, procedure and forms used. 2.2 Information required for process planning and information available from process planning. 2.3 Applications of process & tool plans in a given situation. 2.4 Economy-concept, meaning, importance and principles in tool engineering. 2.5 Universal acts & their elements of a manufacturing operation with suitable simple example. 2.6 Cost-types, methods for calculation and ways to reduce. 2.7 Safety-concept, meaning, importance and norms for tool engineering environment. 2.8 Estimation-concept, meaning, definition, importance, principles, steps, procedure and forms. 2.9 Process planning, estimation of time and estimation of cost for various tool components (having more than 6 operations).	8
3.	Introduction to Tool Design: 3.1 Define, compare and differentiate tool, cutting tool and machine tool. 3.2 Tools-types, classification, features & applications 3.3 Tool materials-types, classification, composition, properties, cutting parameters (for various work piece materials), applications and selection criteria. 3.4 Heat treatment-types, necessity, process, selection criteria and applications for various tool components. 3.5 Tool design-importance, elements, steps, procedure and examples.	4
4.	Cutting Tools Selection: 4.1 Cutting tools-types, classification and applications. 4.2 Geometry, nomenclature/signature and BIS/ISO standards for single point cutting tools, twist drills, hole mills, reamers, plain milling cutter, side & face milling cutter and end mills.(HSS based).	4

	4.3 Criteria for selection of cutting tools for given application /situation. 4.4 Carbide tips/inserts-types, classification, BIS/ISO codification/designation, need, cutting parameters for various work piece materials, selection criteria and applications. 4.5 Grinding/resharpening of cutting tools as per given geometry (Demonstration for single point and multi point cutting tools). 4.6 Form tools-types, importance, nomenclature and applications. 4.7 Correction - meaning, need and graphical method of applying correction. 4.8 Tool setting devices and tool setting machines used for CNC machines.	
5.	Design of Jigs and Fixtures: 5.1 Introduction - concept, purpose, definitions, principles and differences of jigs and fixtures. 5.2 Location and clamping- principles, types, features, working, importance and applications. 5.3 Fool proofing and ejecting. 5.4 Jig- concept, meaning, types, applications, working, components, design steps, design and selection criteria. 5.5 Fixture-concept, meaning, types, applications, working, components, design steps, design and selection criteria. 5.6 Modular concept of JIG & fixture and its application.	9
6.	Design of Press Tools: 6.1 Press working processes. 6.2 Press tools: Introduction, features, types, working, components and their functions. 6.3 Concept, meaning, definitions and calculations of press tonnage and shut height of press tool. 6.4 Cutting Die Design - General aspects and steps. 6.5 Shear action in die cutting operation. 6.6 Centre of pressure: Concept, meaning, definition, methods of finding and importance. 6.7 Die clearance: Concept, meaning, definition, reasons, effects and methods of application. 6.8 Cutting force: Methods to calculate and methods of reducing. 6.9 Scrap strip layout:- Concept, importance, method to prepare, and determining percentage stock utilization. 6.10 Design methods and design of die block, punch, punch support and other die components. 6.11 Types, working, and applications of stock stop, pilots, strippers and knockouts. 6.12 Design of cutting die-types and selection criteria for different components. 6.13 Cutting dies & die sets-types, working, features, applications and selection criteria. 6.14 Types, terminology, features, elements, working, applications and selection criteria for bending, forming, drawing and forging dies.	12
7.	Design of Limit Gauges: 7.1 Elements, types and application of limit gauges. 7.2 Gauge materials, their selection and heat treatment. 7.3 Taylor's principles of gauge design.	3

	7.4	Types and methods to provide gauge tolerances.	
	7.5	Design steps and design of plug & ring / snap gauge for given dimension and application.	

Reference Books:

1. Fundamentals of tool design, ASTM PHI.
2. Tool design Donaldson & Lecain, TME.
3. Tool engineering, Doyal.
4. Principles of tool & jig design, M. H. A. Kempster.
5. Die design fundamentals, J. R. Paquino Industrial press.
6. Production tooling equipments, S. N. Parsons.
7. Production engineering science, Pandey-sign Standard publishers.
8. Design data book, K. Mahadeven Reddy, BPB, Delhi.
9. Design data book, P S G.
10. An introduction to jig & tool design, M.H.A. Kempster Mc GH. Publication
11. Jigs and fixture design Produced by institution of Production engineering.
12. Basic die making D. Engine Ostergard Mc GH Publication
13. Jigs and fixture P. H. Joshi TMGH publication
14. Production technology HMT
15. BIS 1983,3019,2163 for single point Cutting tool
BIS 5101 for twist drills
BIS 5989 for hole mills
ISO 236/II for reamers
BIS for plain milling cutter
BIS 6308 for S/F milling cutter
BIS 6353 for end mills
16. ISO for carbide inserts.