



**Gyanmanjari**  
Innovative University

Course Syllabus  
Gyanmanjari Diploma Engineering College  
Semester-4(Diploma)

**Subject:** Tool Engineering- DETME14212

**Type of course:** Minor

**Prerequisite:** Manufacturing engineering

**Rationale:** Tools are the basic components for any machining process. The quality and efficiency of any machining operation basically depends upon quality of tools which depends upon the proper shape, size and material of the tools. Productivity and quality of machining operations can be improved by proper and quick mounting of tools and jobs on machines. Jigs and fixtures play very important role in this process. So, we can say that this subject develops the abilities in the students to select the proper tool with proper size and shape for the required machining operation. The design of various tools, jigs, fixtures and gauges is also important for this course. Therefore, this course is the core for mechanical engineers.

**Teaching and Examination Scheme:**

Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P	C	Theory Marks		Practical Marks		CA	
				ESE	MSE	V	P	ALA	
3	0	2	4	60	30	10	20	30	150

*Legends: CI-Classroom Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.*



**Course Content:**

Unit No	Course content	Hrs.	% Weightage
1	<b>Introduction:</b> Concept meaning and definition of tool design and tool engineering, Tools – types classification features and applications, Tool engineering – functions and importance to enhance productivity and quality, Importance of process planning in tool engineering. <b>Cutting tools and tool holders:</b> Cutting tool materials – types composition properties and applications, Carbide inserts – types ISO designation and applications, Re-sharpening methods of following cutting tools like Drill Side and face milling cutter End mill Center drill type A & B Gear hob, Tool holders for turning and milling carbide inserts – types ISO designation and applications.	10	20
2	<b>Locating and Clamping devices:</b> Concept meaning and definitions of location and clamping, Use of locating and clamping principles in day-to-day supervision on shop floor, Degree of freedom – concept and importance, 3-2-1 principle of location, Locators & clamping devices like Types Sketches with nomenclature Working and Applications, Fool proofing and ejecting. <b>Jigs and Fixtures:</b> Concept meaning difference and benefits of jigs and fixtures, Types Sketches with nomenclature Working and Applications of Jigs and fixtures, Steps to design jigs and fixtures, for a given component – Select type (jig or fixture) Develop locating method Develop clamping method Design jig and fixture, Prepare details and assembly drawing.	11	25
3	<b>Press Tools:</b> Press working processes – Types Sketches and Applications, Press tools – Types Working Components and their Functions, Concept Meaning Definitions and Calculations of press tonnage and shut height of press tool, Shear action in die cutting operation and Centre of pressure – Concept Meaning Definition Methods of finding and importance, Die clearance – Concept Meaning Definition Reasons Effects and Methods of application and Cutting force Methods to calculate and Methods of reducing, Shear angle – Concept Need and Method to give shear angle on punch and die, Scrap strip layout – Concept Importance Method to prepare and Determining percentage stock utilization, Cutting dies – types and applications, Design of progressive cutting die – Sketch the component Prepare scrap strip layout Calculate tonnage Determine center of pressure Determine dimensions of punches die block and die shoe, Prepare sketch of stripper plate General assembly sketch of punches arrangement die block die shoe and stripper plate.	14	30



4	<b>Dies Moulds and Limit Gauges:</b> Bending – Types Parts and functions of bending die Definition calculations and factors affecting bend radii bend allowance and spring back, Method to compute bending pressure Types sketch working and applications of bending dies Types sketch working and applications of drawing dies (embossing, curling, bulging, coining, swaging and hole flanging), Classifications of limit gauges Desirable properties of gauge materials Advantages and disadvantages of limit gauges, List of factors to be considered in selection of gauge, Taylor's principle of gauge design, Design steps for plug gauges and snap gauges.	10	25
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**Continuous Assessment:**

Sr. No	Active Learning Activities	Marks
1	<b>Case Study</b> Download the catalogs for cutting tools, jigs and fixtures and prepare technical datasheet on their features and specifications. Upload report on GMIU web portal	10
2	<b>Industrial observation</b> Visit a nearby manufacturing unit and observe cutting tools, hand tools, press tools, measuring tools and consumables being used there. Upload photographs with its application on GMIU web portal	10
3	<b>Prototype preparation</b> Innovate and prepare device in workshop and submit photographs on GMIU web portal	10
Total		30

**Suggested Specification table with Marks (Theory):60**

<b>Distribution of Theory Marks</b> (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	30%	30%	40%	-	-	-



**Course Outcome:**

After learning the course, the students should be able to:	
CO1	Understand Tool Design, Tool Engineering, Cutting Tools, Tool Holders, and their applications.
CO2	Comprehend Locating and Clamping Devices, Jigs, Fixtures, and their design and applications.
CO3	Learn Press Tools, Press Working Processes, Die Calculations, and Design Applications.
CO4	Study Dies, Moulds, Limit Gauges, Bending, Drawing Dies, and Gauge Design Principles.

**List of Practical:**

Sr. No	Descriptions	Unit No	Hrs.
1	<b>Introduction &amp; Demonstration of Cutting Tools Re-sharpening:</b> Explore and demonstrate the re-sharpening process for various cutting tools.	1	2
2	<b>Production Drawings of Fixture Parts:</b> Create detailed production drawings for all parts of a fixture.	2	4
3	<b>Assembly Drawing of Fixture with BOM:</b> Draw the assembly of a fixture, including a Bill of Materials (BOM).	2	4
4	<b>Production Drawings of Jig Parts:</b> Produce detailed drawings for all parts of a jig.	2	4
5	<b>Assembly Drawing of Jig with BOM:</b> Draw the assembly of a jig, including a Bill of Materials (BOM).	2	4
6	<b>Production Drawings of Die Block, Die Shoe, and Stripper Plate of Progressive Die:</b> Create detailed production drawings for the die block, die shoe, and stripper plate in a progressive die.	3	4
7	<b>Assembly Drawing of Progressive Die:</b> Draw the assembly, including punches, die, die shoe, and stripper plate for a progressive die.	3	4
8	<b>Limit Gauge Selection &amp; Design:</b> Select and design a limit gauge for a given component.	4	4
		Total	30



**Instructional Method:**

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment. Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

**Reference Books:**

- [1] Tool Engineering and Design by G R Nagpal, Khanna publishers
- [2] Metal Cutting and Tool Design by Ashok Kumar Singh, Vayu Education of India
- [3] Tool Engineering by Vilas S Teli, Nirali Publication
- [4] Production Technology by R.K.Jain, Khanna publishers
- [5] Design of Jigs, Fixtures and Press tools by K. Ventataraman

