

GANPAT UNIVERSITY									
FACULTY OF ENGINEERING & TECHNOLOGY									
Programme		Diploma Engineering			Branch		Mechanical Engineering		
Semester		VI			Version		1.0.0.0		
Effective from Academic Year				2020-21		Effective for the batch Admitted in			July 2018
Subject code		1ME2602	Subject Name			Tool engineering			
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	30	20	50

Pre-requisites:

Course Learning Outcomes:
<p>The course content should be taught and implemented with an aim to develop different skills leading to the achievement of the following competencies and course learning outcomes:</p> <p>CO1.To understand the importance of tool engineering as a link between design and manufacturing, its functioning and to select proper cutting tool/tool geometry as per need of operation and to re-sharpen it for long tool life.</p> <p>CO2. To select and design appropriate and accurate location and restrict all degrees of freedom while machining operation to any component.</p> <p>CO 3. To provide devices to the manufacturing domain which leads to ease in performing various drilling and other machining operation in batch/mass production and fulfil other important aspects like maintaining interchangeability, accuracy, repeatability, quick set-ups and change over time and reduce operator’s physical and mental fatigue in an economical domain.</p> <p>CO 4.To understands designing complexities and other important aspects of cutting dies through case study of a simple configured component.</p> <p>CO 5. To gain the knowledge of principles, working and design terminologies of various sheet metal forming dies, drawing dies, forging dies and other special forming dies for many industrial applications.</p>

Course Content				
Name of UNIT	Unit Content	Unit Learning Outcomes	Marks	Hrs
UNIT – 1 (Introduction)	1.1 Tool engineering definition, functions and importance of tool design concept. 1.2 Categorisation of various types of tools and importance of designing tools for productivity, quality and economical aspects. 1.3 Importance of process planning in tool engineering. 1.4 Selection of proper types of Cutting tool materials, considering composition, properties and	1a.To explain role of tool engineering in industries. 1b. To establish broad meaning of tool to link design of product with quality manufacturing. 1c. To implement process planning phase to design tools to reduce errors and enhance accuracy and quality aspects. 1d. To select best combination of tools from various	10	6

	<p>standard ISO- designation of Carbide inserts- insert holder types and applications as required for the industrial application</p> <p>1.5 Re-sharpening methods of following cutting tools, Drill, Side and face milling cutter, End mill in tool and cutter grinder.</p>	<p>alternatives for economical viewpoint and standardisation.</p> <p>1e. To understand setups for re-sharpening of various cutting tools on tool and cutter grinder machine for different geometries of cutting general purpose cutting tools.</p>		
UNIT – 2 (Locating and clamping devices)	<p>2.1 Concept, meaning and definitions of location and clamping.</p> <p>2.2 Degree of freedom-concept and importance of 3-2-1 principle of location.</p> <p>2.3 Types, applications and guidelines to design and selection of locating and clamping systems considering its design principles for industrial applications for different part geometry.</p>	<p>2a. To select the best and economical locating and clamping systems suitable for real time part manufacturing</p> <p>2b. To enhance proper locating, accuracy, repeatability, Interchangeability, reducing fatigue and provide safety to perform identical operations in mass and batch production.</p>	8	6
UNIT – 3 (Jigs and fixtures)	<p>3.1 Definition, Concept and meaning of jigs and fixtures, its similarities and differences.</p> <p>3.2 Design features common to both jig and fixtures.</p> <p>3.3 Commonly applicable features, types, and configurations with nomenclature, working and applications of jigs and fixtures.</p> <p>3.3 Case study of designing Jig and fixture for a given component configuration by the application of proper locating and clamping systems and other applicable principles of jig-fixture design.</p> <p>3.4 To prepare detail and assembly drawings and generate bill of materials using any CAD software.</p>	<p>3a. Appreciate the differences and similarities between jigs and fixtures.</p> <p>3b. Apply principles of design jig and fixture to reduce cost and economical production in mass and batch production environment.</p> <p>3c. To apply ideas and creativity for selection of proper system of jig and fixture for real time applications.</p> <p>3d. To appreciate the importance of applying CAD software for jigs and fixture design by consideration of weight optimisation, proper material selection and reduce labour cost considering design for manufacturing aspects.</p>	12	8
UNIT – 4 (Press tools)	<p>4.1. Press working processes for various cutting operations.</p> <p>4.2. Types of press tools and its applications</p> <p>4.3 Shear action theory in die cutting</p>	<p>4a. To understand shearing die operations.</p> <p>4b. To recognise various designs of press tools.</p> <p>4c. To optimise smooth cutting</p>	16	15

	<p>operation.</p> <p>4.4. Components common to press tools. Various configuration of standard die set, Mounting arrangements of punches and dies, Types of strippers, pilots and knockout mechanism and its applications,, various accessories used for proper working of cutting dies, types of stock stoppers and its applications.</p> <p>4.5. Design calculation for cutting force requirements, center of pressure calculations and its importance, methods of reducing cutting forces, die clearance, importance of proper clearance between die and punch.</p> <p>4.6. Centre of pressure: Concept, meaning, definition, methods of finding and importance.</p> <p>4.7 Case study of designing progressive die for a given configuration of simple component involving blanking and piercing operations.</p> <p>4.8. Preparation of optimal strip/stock layout of the given component and calculation of material utilisation and scrap percentage.</p> <p>4.9 Design a progressive die of the case study component and make necessary calculations, use standard drafting techniques and prepare and detail - assembly drawings with part list.</p>	<p>action and to provide proper surface finish.</p> <p>4d. To acquire benefits of standardisation while manufacturing press tool for customising industrial design requirements.</p> <p>4e. To withstand various cutting forces and provide better tool life for various components and accessories of the press tool.</p> <p>4f. Recognise the importance of optimum utilisation of sheet metal/material to reduce the wastage/scrap for the given configuration of part to be cut.</p> <p>4g. To implement progressive cutting die design concepts for given simple component and gain the ideas to implement it for more complicated configurations of part.</p> <p>4h. To apply drafting techniques in working drawings of the cutting die.</p>		
<p>UNIT – 5 (Dies and Die moulds)</p>	<p>5.1 Concept of sheet metal forming dies and its operations, bending types, bend allowance, spring back bending force calculations of various types of bending operations.</p> <p>5.2 Drawing dies-types and method to determine blank size for drawing operation.</p> <p>5.3 Special types of forming operations concepts, sketch, working and applications of (embossing, curling, bulging, coining, swaging and hole flanging).</p> <p>5.4 Forging dies- terminology, types, sketch, working and applications.</p> <p>5.5 Sketch, working and applications of following dies/mould: Plastic</p>	<p>5a.To appreciates major design considerations necessary of bending and drawing dies.</p> <p>5b. To appreciate major design considerations necessary of drawing dies.</p> <p>5c. To get through general ideas of special methods of forming operations and its applications.</p> <p>5d. To understand the terminology used while designing forging dies to increase its productivity and life.</p> <p>5e. To understand the application of tools used in</p>	<p>14</p>	<p>10</p>

	injection, Extrusion, Blow moulding	miscellaneous components manufacturing and working of plastic injection, extrusion and blow moulding processes.		
			Total	60 45

List of Practical			
No.	Unit	Name of Practical	
1	1	Geometry of various types of cutting tools (Single point cutting tool, Plain milling cutter, Twist drill)and its re-sharpening methods of any one cutting tool. (2D drawings in sheet)	
2	2	Design of locators and clamps.(Prepare drawings of any types five locators and any one toggle action clamp in using any CAD software)	
3	3	Case study: Design a suitable Jig for the given component (2D detail and assembly drawings in sheet)	
4	3	Case study: Design a suitable Jig for the given component (2D detail and assembly drawings in sheet)	
5	4	Case study: Design a progressive(only 2D assembly drawings in sheet) die for the given component make necessary calculations for strip layout design, material utilisation and percentage scrap, cutting force requirements, size of punch and die considering clearance factor	
List of Instruments/Equipment/Trainer Board			
1	Drawing sheets/stationary/drafting instruments/file pages/workbooks		
2	Various Cutting tools like drill, milling cutters, single point cutting tools H.S.S/carbide inserts etc.		
3	Jigs and fixtures devices for demonstration/video tutorials etc.Cad workstation with any one parametric design software to design any one case study from given practical listed out.		
4	Various (especially progressive) dies for demonstration and Mechanical press for fitting cutting die.		
Link of Text Books			
No.	Title of Books	Authors	Publication
1	Fundamentals of tool design	ASTME	PHI.
2	Tool design	Donaldson &Lecain. V.C Goold	TME
3	Production engineering	P.C.Sharma	S.Chand
4	Jigs and fixture	P. H. Joshi	TMGH
List of Reference Books			
No.	Title of Reference Books	Authors	Publication
1	Design Of Jigs Fixtures And Press Tools	C. Elanchezhian, T. Sunder Selwyn, B. VijayaRamnath	Eswar Press,2007, 2nd Edition
2	Cutting tools standards.	-	BIS
3	Production technology	-	HMT
4	PSG Design data book	PSG, Coimbatore	PSG, Coimbatore
5	Tool engineering: analysis and procedure	Lawrence E. Doyle	Prentice-Hall, 1950
Link of Learning Web Resource			
1	https://www.youtube.com/watch?v=7yzvno4AvKw		
2	https://www.youtube.com/watch?v=vOo2MCYPsm4		
3	https://www.youtube.com/watch?v=UbliMiADZ40		
4	https://www.youtube.com/watch?v=F65ldPWfh7k		
5	https://www.youtube.com/watch?v=SoTfSOj6q0		
6	https://www.youtube.com/watch?v=-eykdYvws4k		

7	https://www.youtube.com/watch?v=woMELHmq3UI
8	https://www.youtube.com/watch?v=naEziRPNkDU

PO & CO Mapping							
Sr.N O.	Name of PO	Description	Co1	Co2	Co3	Co4	Co5
1	PO 1	Acquire fundamental knowledge of mathematics, science, and mechanical engineering.	Moderate	Slight	Moderate	Moderate	Moderate
2	PO 2	Design and conduct experiments, as well as analyze and interpret data.	Moderate	Moderate	substantial	substantial	Moderate
3	PO 3	Use the techniques, skills, and modern engineering tools necessary for engineering practice	Moderate	Moderate	substantial	Moderate	Moderate
4	PO 4	Function in multi-disciplinary teams and identify, formulate, and solve engineering problems.	Slight	Slight	substantial	substantial	Moderate
5	PO 5	Clear understanding of his duties and responsibilities as a mechanical engineer.	substantial	Slight	Slight	Slight	Moderate
6	PO 6	Develop effective communication skill and provide leadership for professional development.	Moderate	Slight	substantial	Moderate	Moderate
7	PO 7	Engage in life-long learning in mechanical engineering field and comprehend issues related to environment and sustainable development.	Moderate	Slight	Slight	Slight	Slight
8	PO 8	Graduate will demonstrate knowledge of professional and ethical responsibilities.	substantial	Moderate	substantial	substantial	substantial
9	PO 9	Incorporate economics and business practice including project and risk management.	Moderate	none	Moderate	Moderate	Moderate
10	PO 10	Graduated are able to share their knowledge to the industries as well as society.	substantial	Slight	substantial	substantial	substantial
11	PO 11	Graduated will be able to apply their skill and knowledge for the sustainable development of nation.	substantial	Moderate	substantial	substantial	substantial
12	PO 12	Graduated are able to learn to work with the team and also with the inter discipliners.	Moderate	Slight	substantial	substantial	substantial