BMEE403L	Design of Jigs Fixtures and Press Tools	L	T	P	C
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Pre-requisite	**BMEE301L**	**Syllabus version**			
		1.0			

Course Objectives:

1. To impart knowledge on the principles of jigs and fixtures design, locating principles, locating elements and clamping Devices.
2. To design and analyze Jigs, Fixtures and dies for press working.
3. To select appropriate work holding devices for various applications.

Course Outcome:

At the end of the course, the student will be able to

1. Justify the requirements of jigs and fixtures for manufacturing, testing and assembly.
2. Design and develop locating and clamping systems for the given component based on geometrical and dimensional features.
3. Design and develop jigs fixtures, press tools and forming dies for various manufacturing processes.
4. Design of smart work holding for industrial applications.
5. Suggest and design appropriate tools for various manufacturing processes.

Module:1	**Tool Design**	**4 hours**

Tool engineering – tool classifications– tool design objectives – tool design in manufacturing-challenges and requirements- standards in tool design-tool drawings -surface finish – fits and tolerances - tooling Materials.

Module:2	**Locating elements**	**4 hours**

Jigs and Fixtures- basic elements – degrees of freedom- principles of location – locating methods and devices – function and advantages of jigs and fixtures -redundant location.

Module:3	**Clamping elements**	**4 hours**

Principles of clamping – mechanical actuation – pneumatic and hydraulic actuation standard parts – types of clamps-clamping force calculation-design of clamps-smart work holding devices.

Module:4	**Design of Jigs**	**7 hours**

Types of jigs; plate, latch, channel, box, post, angle plate, angular post, turnover, pot jigs- jig bushes- types of bushes- automatic drill jigs-rack and pinion operated - air operated jigs - design and development of jigs for specified components.

Module:5	**Design of Fixtures**	**8 hours**

General principles of boring, lathe, milling and broaching fixtures - grinding, planning and shaping fixtures, assembly, inspection and welding fixtures- modular fixtures – quick change fixtures-design and development of fixtures for specified component.

Module:6	**Design of Press Tool and Dies**	**8 hours**

Press working terminologies – operations – types of presses – press accessories – computation of press capacity – strip layout – material utilization – shearing action – clearances – press work materials – centre of pressure- design of various elements of dies – design of blanking, piercing dies- compound and progressive dies - design considerations in forging, extrusion, casting and plastic dies.

Module:7	**Design of Forming Dies**	**8 hours**

Difference between bending and drawing – blank development for above operations – types of bending dies – press capacity – spring back – knockouts – direct and indirect – pressure pads – ejectors – variables affecting metal flow in drawing operations – draw die inserts – draw beads- ironing – design and development of bending, forming, drawing, reverse redrawing and combination dies – blank development for axisymmetric, rectangular and elliptic parts – single and double action dies.

Module 8	**Contemporary issues:**	**2 hours**

	Total Lecture hours:			**45 hours**
Text Books				
1.	Donaldson C, Tool Design, 2012, Tata McGraw-Hill.			
2.	Edward G Hoffman, Jigs & Fixture Design, 2004, Thomson – Delmar Learning, Singapore.			
Reference Books				
1.	Kempster, Jigs & Fixtures Design, 1978, The English Language Book Society.			
2.	Joshi, P.H, Jigs & Fixtures, 2004, 2nd Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi.			
3.	Hiram E Grant, Jigs and Fixture, 2003, Tata McGraw-Hill, New Delhi.			
4	Fundamentals of Tool Design, 1983, CEEE Edition, ASTME.			
Mode of Evaluation: CAT, written assignment, Quiz, FAT.				
Recommended by Board of Studies		09-03-2022		
Approved by Academic Council		No. 65	Date	17-03-2022