



# GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Branch: Mechanical Engineering (Production)

Course / Subject Code : ME01000541

Course / Subject Name : Tool and Die Design

w. e. f. Academic Year:	2024-25
Semester:	1 <sup>st</sup> Semester
Category of the Course:	PEC

<b>Prerequisite:</b>	Nil
<b>Rationale:</b>	This course provides the knowledge and practice regarding different Cutting Tool Design and Analysis. This course gives practice for various Drilling Jig, Milling Fixture Design helping in Industries for Big Job Locating and Clamping work also Design Forging Die, Casting Die and Press Tools Design.

## Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT level
1	Understand basics of tool design.	Understanding
2	Design Jigs and Fixtures for Real life application.	Analyze
3	Demonstrate basics of press tool and forging die design fundamentals for real life design problems.	Analyze
4	Distinguish basics of injection mold and die casting fundamentals for real life industry design problems.	Evaluate
5	Analysis of die casting design in terms of selection of metals and defects.	Evaluate

## Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Tutorial / Practical		
				ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
3	0	2	4	70	30	20	30	150

## Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Fundamentals of cutting tool design, cutting tools and their principal elements, Tool geometry, system of nomenclatures and their interrelations, setting for the grinding of various basic cutting tool (turning, drilling, milling).	6	15



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2.	Analyses and Design of Jigs and Fixture, Principles of jig and fixture design, Dual cylinder location, diamond pin analysis, V-block analysis, design principles of centralizers, various mechanisms and design of equalizers, analysis for optimum number of clamping forces required and calculation of their magnitudes, concept of modular fixtures, design of fixtures for NC/CNC machines, computer applications in fixture design and analysis.	9	20
3.	Design of press tools: Components of die design, design of die blocks, punches and strippers, methods of holding punches, sketches of stock stops, Design procedure for progressive dies, compound dies and combination dies for press tool operation, forging die design for drop and machine forging parts. Computer applications in press tool design.	8	20
4.	Design of forging dies: Grain flow considerations, parting line selection, draft, design problems involving ribs, bosses and fillets. Flash and flash control, determination of number of impressions required and their sequence, design steps and analysis of forging dies, detail calculations, shrinkage, cavity shapes, heat transfer considerations, cooling and ejection systems, Automation in forging operations, computer aided design and analysis.	9	20
5.	Design of injection molds: Principles of melt processing, product considerations, determination of economical number of cavities, temperature control of injection molds, calculation of mold opening force and ejection force. Detail design of cooling system, ejection system and gating system. Moldability features, mold flow analysis.	6	15
6.	Die casting die design: Metals for die casting, specific details of die construction, casting ejectors, side cores, loose die pieces, slides, types of cores, directional solidification, types of feeders, die venting, water cooling, design aspects of die casting dies, defects.	5	10
<b>Total</b>		<b>45</b>	<b>100</b>

## Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	15	15	25	25	10

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

## References/Suggested Learning Resources:

### (a) Books:

1. C B Cole: "Tool Design" American Technical society publication Chicago, USA



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2. Donaldson: "Tool Design", Tata McGraw Hill.
3. ASTM: "Fundamentals of Tool Design"
4. P.C.Sharma: "A Textbook of Production Engineering".,
5. S. Chand Publication, N. Delhi
6. Ivana Suchy, "Handbook of Die Design", 2nd edition McGraw Hill.
7. Ventatraman, "Design of Jigs, Fixtures and Press Tools", Ascent Series Tata McGraw Hill.
8. Deshpande D. L., "Basic Tools", 2nd edition University Press.

**(b) Open-source software and website:**

- 1.
- 2.

**Suggested Course Practical List:**

1. Design of Jigs and Fixture
2. Design of press tools
3. Design of forging dies
4. Design of injection moulds
5. Die casting die design

**List of Laboratory/Learning Resources Required:**

1. Drill Jigs For heavy duty Radial Drill Machine
2. Milling Fixture for Profile Cutting
3. Forging Machine
4. Combination Press

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