DEPARTMENT OF PRODUCTION TECHNOLOGY
MIT CAMPUS
ANNA UNIVERSITY: : CHENNAI – 600 044.

COURSE PLAN

COURSE DETAILS:

Degree	B.E.		
ProgrammeName	PRODUCTION ENGINEERING		
Course Code &Title	PR5008 DESIGN OF CASTINGS AND WELDMENTS		
Credits	3	**Session**	JAN 2024 – MAY 2024
Course Type	Program Core	**Section**	1
Name of the Faculty	Dr. N. SRIRANGARAJALU, Assistant Professor, Department of Production Technology, MIT Campus, Anna University, Chennai -44		

COURSE OBJECTIVES:

The main learning objective of this course is to prepare the students for:

1. To expose the students to design for conducting the machining processes.
2. To impart knowledge to the students about the design principles of casting.
3. To impart knowledge to the students about the design principles of welding.
4. To conduct some of the cleaning and coating processes.
5. To outline various casting processes, several defects that appear in cast part and corresponding remedial measures, and general recommendations to achieve a good quality casting.

UNIT I DESIGN FOR MACHINING 9

Introduction to machining, Recommended materials for machinability, Design recommendations, Design for tuning operation: Process description, Typical characteristics and applications, Suitable materials, Design recommendations, Design for machining round holes: Introduction, Suitable materials, Design recommendations, Recommended tolerances, Parts produced by milling: Process description, Characteristics and applications of parts produced on milling machines, Design recommendations for milling, Dimensional factors and tolerances, Parts produced by planning, shaping and slotting: Process description, Design recommendation planning, Design for broached parts: Process description, Typical characteristics of broached parts, Suitable materials for broaching, Design recommendations.

UNIT II DESIGN FOR CASTING 9

Introduction to sand casting, Typical characteristics of a sand cast part, Design recommendation for sand casting, Investment casting: Introduction, Steps in investment casting, Design consideration of Investment casting, Typical characteristics and applications, Die casting: Introduction to die casting, Advantages of the die casting process, Disadvantages of the die casting process, Applications, Suitable material consideration, General design consideration, Specific design recommendation,

UNIT III DESIGN FOR WELDING 9

Different types of welding processes, Design for welding: Design for recommendation for welding process, Design for solder and brazed assembly: Process, Typical characteristics, Suitable materials, Detail Design recommendations, Design for adhesively bonded assemblies: Introduction, Typical characteristics, Suitable materials, Design recommendations for adhesive

joint,.

UNIT IV DESIGN FOR CLEANING **9**

Introduction to cleaning process, In-process cleaning operations, Cleaning processes and their applications, Design recommendations, Design for polishing and plating: Introduction to Polishing processes, Design recommendations for polishing process, Design for plated surface: Electroplating process, Typical characteristics, Design recommendations for plating, Hot Dip Metallic Coating: Process, Design recommendations for Hot Dip Metallic coating, Thermal sprayed coating: Process, Design recommendations for thermal sprayed coating, Vacuum Metalized surfaces: The process, Typical characteristics and applications, Design recommendations, Design for heat treatment: Introduction to heat treatment, Heat treating process for steel, Applications of heat-treated parts, Design recommendations for heat treatment.

UNIT V DESIGN FOR ASSEMBLY **9**

The assembly process, Characteristics and applications, Example of common assembly, Economic significance of assembly, General taxonomies of assembly operation and systems, Limits fits and tolerances - Interchangeability, selective assembly, limits, fit and tolerances, limit gauging, design of limit gauges, Assembling a product, Design for Assembly: Introduction, Design consideration, Design for Fasteners: Introduction, Design recommendation for fasteners.

45 PERIODS

COURSE OUTCOMES:

Students will able to

CO1: Apply design principles and design concepts for machining to ensure successful machining processes.

CO2: Analyze the design considerations for casting to ensure optimal casting outcomes and minimize defects

CO3: Evaluate design principles related to welding and ensure strong and reliable joints.

CO4: Explain of various cleaning processes to maintain the quality and functionality of components.

CO5: Apply design principles for assembly to create designs that simplify the assembly process.

TEXT BOOKS:

1. Parmar,R.S., Welding Processes and Technology, Khanna Publishers, 2006.
2. Jain,P.L., Principles of Foundry Technology, Tata McGraw Hill, 2006.

REFERENCES:

1. J. Lesko, (1999) Industrial Design, Materials and Manufacture Guide, John Willy and Sons, Inc
2. George E. Dieter and Linda C. Schmidt (2009), Engineering Design, Fourth edition, McGrawHill companies, New York, USA
3. Geoffrey Boothroyd, Peter Dewhurst and Winston Knight (2002) Product Design for Manufacture and Assembly, Second Edition, CRC press, Taylor & Francis, Florida, USA
4. O. Molloy, S. Tilley and E.A. Warman (1998) Design for Manufacturing and assembly, First Edition, Chapman &Hall, London, UK.
5. D. E. Whitney, (2004) Mechanical Assemblies: Their Design, Manufacture, and Role in Product Development, Oxford University Press, New York.

COURSE ARTICULATION MATRIX

CO	PO

	1	2	3	4	5	6
1	2	2	3	1	-	-
2	2	2	3	1	-	-
3	2	2	3	1	-	-
4	2	2	3	1	-	-
5	2	2	3	1	-	-
CO/PO & PSO Average	2	2	3	1	-	-

The correlation levels:1: Low;2: Medium;3: High.

COURSE ALIGNED PROGRAMME OUTCOMES (PO)

PO	PROGRAMME OUTCOME
1	An ability to independently carry out research/investigation and development work to solve practical problems.
2	An ability to write and present a substantial technical report/document.
3	Students should be able to demonstrate a degree of mastery in the area of mechatronics.
4	Graduates will have a solid understanding of key concepts, methodologies, core components, and contemporary tools and techniques essential for unified mechatronics systems with intelligence.
5	Students will develop, analyze and optimize the solution for diverse engineering challenges using a mechatronics-based approach.
6	Graduates will be capable of constructing real-time or virtual mechatronic systems with considerations for industrial standards, environmental impact, ethical principles, and socio-economic factors.

COURSE TENTATIVE SCHEDULE / PLAN

Week	Day	Date	Hrs	Unit	Topics	Text / Ref.
1	TUE	23.01.202	8		Introduction to machining, Recommended	T1,R1

		4			materials for machinability, Design recommendations	
	THU	25.01.2024	1,2	UI	Design for tuning operation: Process description, Typical characteristics and applications, Suitable materials, Design recommendations,	T1
2	TUE	30.01.2024	8		Design for machining round holes: Introduction, Suitable materials, Design recommendations,	T1
	THU	01.02.2024	1,2		Recommended tolerances, Parts produced by milling: Process description, Characteristics and applications of parts produced on milling machines,	
3	TUE	06.02.2024	8		Design recommendations for milling, Dimensional factors and tolerances	T1
	THU	08.02.2024	1,2		Parts produced by planning, shaping and slotting: Process description, Design recommendation planning, Design for broached parts: Process description,	T1
4	TUE	13.02.2024	8		Typical characteristics of broached parts, Suitable materials for broaching, Design recommendations.	T1
	THU	15.02.2024	1,2	U II	Introduction to sand casting, Typical characteristics of a sand cast part, Design recommendation for sand casting	T1
5	TUE	20.02.2024	8		Investment casting: Introduction, Steps in investment casting	T1
	THU	22.02.2024	1,2		Design consideration of Investment casting, Typical characteristics and applications,	T1
6	TUE	27.02.2024	8		Die casting: Introduction to die casting,	T1
	THU	29.02.2024	1,2		Advantages of the die casting process, Disadvantages of the die casting process, Applications, Suitable material consideration,	T1
7	TUE	05.03.2024	8		General design consideration, Specific design recommendation,	T1
	THU	07.03.2024	1,2	U III	Different types of welding processes	T1
8	TUE	12.03.2024	8		Design for welding: Design for recommendation for welding process,	T1
	THU	14.03.2024	1,2		Design for solder and brazed assembly: Process, Typical characteristics,	T1
9	TUE	19.03.2024	8		Suitable materials, Detail Design recommendations	T1
	THU	21.03.2024	1,2		Design for adhesively bonded assemblies: Introduction, Typical characteristics,	T1
10	TUE	26.03.2024	8		Suitable materials, Design recommendations for adhesive joint,	T1
	THU	28.03.202	1,2		Introduction to cleaning process, In-	T1

		4		U IV	process cleaning operations, cleaning processes and their applications, Design recommendations,	
11	TUE	02.04.2024	8		Design for polishing and plating: Introduction to Polishing processes, Design recommendations for polishing process	T1
	THU	04.04.2024	1,2		Design for plated surface: Electroplating process, Typical characteristics, Design recommendations for plating,	T1
12	TUE	09.04.2024	8		Hot Dip Metallic Coating: Process, Design recommendations for Hot Dip Metallic coating,	T1
	THU	11.04.2024	1,2		Thermal sprayed coating: Process, Design recommendations for thermal sprayed coating, Vacuum Metalized surfaces: The process,	
13	TUE	16.04.2024	8		Typical characteristics and applications, Design recommendations,	T1
	THU	18.04.2024	1,2		Design for heat treatment: Introduction to heat treatment, Heat treating process for steel,	T1
14	TUE	23.04.2024	8		Applications of heat-treated parts, Design recommendations for heat treatment.	T1
	THU	25.04.2024	1,2	U V	The assembly process, Characteristics and applications, Example of common assembly,	T2
15	TUE	30.04.2024	8		Economic significance of assembly, General taxonomies of assembly operation and systems,	T2
	THU	02.05.2024	1,2		Limits fits and tolerances - Interchangeability, selective assembly, limits, fit and tolerances, limit gauging, design of limit gauges,	T2
16	TUE	07.05.2024	8		Assembling a product, Design for Assembly: Introduction, Design consideration,	T2
	THU	09.052024	1,2		Design for Fasteners: Introduction, Design recommendation for fasteners.	T2

COURSE DELIVERY/INSTRUCTIONAL METHODOLOGIES:

✓Chalk & Talk	✓ Stud. Assignments	✓Web Resources
✓ LCD/~~Smartboards~~	✓ Stud. Seminars	☐ Add-On Courses

COURSE ASSESSMENT METHODOLOGIES-DIRECT

✓ University (End Semester) Examination		✓Internal Assessment Tests	
✓ Assignments	✓ Laboratory Practices	✓ Mini/Major Projects	✓Stud. Seminars
☐ Viva Voce	☐ Certifications	☐ Add-On Courses	☐ Others

COURSE ASSESSMENT METHODS

S.N.	Mode of Assessment	Test		Date	Duration		% Weight
1.	**Continuous Assessment Theory (25%)**	Assessment Test 1			1½ hr		25%
		Assessment Test 2			1½ hr		
2.	**Continuous Assessment Laboratory (Total 25%)**	Experiment and Midterm Test			3 hr		25 %
3.	**End Semester Examination (50%)**	Theory (25%)	Laboratory (25%)		3 hr	3 hr	50 %

COURSE ASSESSMENT METHODOLOGIES-INDIRECT

✓ Assessment of CO (By Feedback, Once)	✓ Student Feedback On Faculty (Once)
☐ Assessment of Mini/Major projects by Ext. Experts	☐ Others

COURSE (EXTRA) ESSENTIAL READINGS:
Will be provided to the students during the class hours.

1. https://nptel.ac.in/courses/106105193
2. https://onlinecourses.nptel.ac.in/noc22_ee12/preview

COURSE EXIT SURVEY (will be collected at end of the course)

The purpose of this survey is to find out from students about their learning experiences and their thoughts about the course.

Rating	1: Slight (Low)	2: Moderate (Medium)	3: Substantial (High)
CO1			
CO2			
CO3			
CO4			
CO5			

COURSE POLICY (Compensation Assessment)

1. Attending all the assessment is mandatory for every student
2. Course policy will be followed as per the academic course regulation

COURSE ACADEMIC DISHONESTY AND PLAGIARISM

1. All rules and regulation prescribed by the ACOE, University Departments, are applicable in the Internal Assessment Tests and University (End Semester) Examinations. (https://acoe.annauniv.edu/download_forms/student_forms/Guidelines.pdf)

2. In general, possessing a mobile phone, carrying bits of paper with materials, talking to other students, copying from other students during Internal Assessment Tests and University (End Semester) Examinations will be treated as Malpractice and punishable as per the rules and regulations. The misuse of Assignment / Project / Seminar works from others is considered as academic dishonesty and will be treated with the rules and regulations of the University.

COURSE ADDITIONAL INFORMATION

Queries / clarifications / discussion (if required) may be e-mailed to / contact the course instructors during their Office Hours.

For Approval

Course Faculty **Course Coordinator** **Professor In Charge**

Head of the Department