

DEPARTMENT OF PRODUCTION TECHNOLOGY

MIT CAMPUS

ANNA UNIVERSITY: : CHENNAI – 600 044.

COURSE PLAN

COURSE DETAILS:

Degree	B.E.		
ProgrammeName	PRODUCTION ENGINEERING		
Course Code &Title	PR5401 FOUNDRY AND WELDING TECHNOLOGY		
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 enhance the knowledge about principles/methods of casting with detail design of gating/riser system needed for casting, defects in cast objects and requirements for achieving better casting.
2. To impart the basic principle, procedure and applications of various Foundry and Welding methods.
3. To knowledge the principle, thermal and metallurgical aspects during solidification of metal and alloys.
4. To discuss SMAW, GMAW, GTAW, Oxy-acetylene welding and resistance spot welding processes.
5. To have a improve knowledge to design a casting and welding process and metallurgical and weldability aspects of different common engineering materials.

UNIT I CASTING PROCESSES

9

Introduction to casting – pattern – materials allowances – coding – types – moulds – mould making, sand – properties, types and testing of sands – core making – type of cores – single box, two box and three box moulding processes, runner, riser and gate and chills chaplets.

UNIT II SPECIAL CASTING PROCESSES

9

Pressure die casting – Centrifugal – continuous – investment – shell moulding – squeeze – electro slag casting – CO₂ moulding – Plaster Mould castings – Antioch process – Slush casting- Counter gravity low pressure casting - electro-magnetic casting

UNIT III METAL JOINING PROCESSES

9

Introduction to soldering, brazing and welding Types of joints – plane of welding – edge preparation – filler material – flux – shielding gases – fusion welding – gas welding – flame types – Manual arc welding – arc theory – power supply – braze welding – Thermit welding – Resistance welding – spot, seam, projection, percussion and flash- Shielded Metal Arc welding, Gas Metal Arc Welding-Gas Tungsten Arc Welding.

UNIT IV SPECIAL WELDING PROCESSES

9

Submerged arc welding – Flux Cored Arc Welding – Electro slag welding – friction welding – explosive welding – Underwater welding – Diffusion bonding – EBW – LBW – PAW – Stud welding

– welding of dissimilar materials – Friction stir welding – High frequency induction welding.

UNIT V TESTING OF CASTINGS AND WELDMENTS

9

Causes and remedies for casting defects – welding defects – Destructive testing – Non Destructive Testing (NDT) methods– Testing: Dye penetrant – magnetic particle – X-ray - Radiography - ultrasonic - Case studies in testing of welded joints and castings.

45 PERIODS

COURSE OUTCOMES:

Students will able to

CO1: Explain the key concepts and terminology related to pattern making, moulding, and core making in casting processes.

CO2: Evaluate and select appropriate special most suitable casting method for a given application.

CO3: Recall the fundamental concepts, terminologies, and classifications of joints and welding methods.

CO4: Compare the behavior of common and emerging welding techniques, considering their advantages and limitations a system to a simulation model.

CO5: Summarize and categorize various casting and welding defects using destructive and nondestructive testing methods

TEXT BOOKS:

1. Jain .P.L., "Principle of Foundry Technology", Tata McGraw Hill ,4th edition, 2004.

2. Parmer .R.S , "Welding Engineering and Technology", Khanna Publishers , 2004.

REFERENCES:

3. Curry .B., "Modern Welding Technology" , Prentice Hall ,2008.

4. Heime, Looper and Rosenthal, "Principle of metal casting" , Tata McGraw Hill ,2nd edition 2002.

3. Little, "Welding Technology", Tata McGraw Hill, 2008.

5. Taylor HF Fleming, "Foundry Engineering", M.C. and Wiley Eastern Ltd., 2003. 5. Ramana Rao, T. V., Metal Casting – Principles and Practice, New Age International Pvt. Ltd. (2003).

COURSE ARTICULATION MATRIX

CO	PO					
	1	2	3	4	5	6
1	1	1	1	-	1	3
2	1	1	1	-	2	3
3	1	1	1	-	1	3
4	1	1	1	-	2	3
5	1	1	1	-	2	3
CO/PO & PSO Average	1	1	1	-	1.6	3

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	MON	22.01.2024	5	UI	Introduction to casting	T1,R1
	TUE	23.01.2024	3,4		pattern – materials allowances – coding types	T1
2	MON	29.01.2024	5		moulds – mould making, sand – properties,	T1
	TUE	30.01.2024	3,4		types and testing of sands – core making	
3	MON	05.02.2024	5		type of cores	T1
	TUE	06.02.2024	3,4		single box, two box and three box moulding processes	T1
4	MON	12.02.2024	5		runner, riser and gate and chills chaplets.	T1
	TUE	13.02.2024	3,4		Pressure die casting – Centrifugal	T1
5	MON	19.02.2024	5		continuous – investment – shell moulding	T1
	TUE	20.02.2024	3,4		squeeze – electro slag casting – CO2 moulding	T1
6	MON	26.02.2024	5		Plaster Mould castings	T1

	TUE	27.02.2024	3,4	U II	Antioch process – Slush casting- Counter gravity low pressure casting	T1
7	MON	04.03.2024	5		electro-magnetic casting.	T1
	TUE	05.03.2024	3,4	U III	Introduction to soldering, brazing and welding Types of joints	T1
8	MON	11.03.2024	5		plane of welding – edge preparation, filler material	T1
	TUE	12.03.2024	3,4		flux – shielding gases – fusion welding – gas welding, flame types	T1
9	MON	18.03.2024	5		Manual arc welding – arc theory – power supply – braze welding	T1
	TUE	19.03.2024	3,4		Thermit welding – Resistance welding – spot, seam, projection, percussion and flash	T1
10	MON	25.03.2024	5		Shielded Metal Arc welding, Gas Metal Arc Welding-Gas Tungsten Arc Welding.	T1
	TUE	26.03.2024	3,4	U IV	Submerged arc welding	T1
11	MON	01.04.2024	5		Flux Cored Arc Welding	T1
	TUE	02.04.2024	3,4		Electro slag welding – friction welding	T1
12	MON	08.04.2024	5		explosive welding – Underwater welding	T1
	TUE	09.04.2024	3,4		Diffusion bonding – EBW - LBW	
13	MON	15.04.2024	5		PAW, Stud welding	T1
	TUE	16.04.2024	3,4		welding of dissimilar materials – Friction stir welding	T1
14	MON	22.04.2024	5		High frequency induction welding.	T1
	TUE	23.04.2024	3,4	U V	Causes and remedies for casting defects–welding defects	T2
15	MON	29.04.2024	5		Destructive testing	T2
	TUE	30.04.2024	3,4		Non-Destructive Testing (NDT) methods Testing: Dye penetrant – magnetic particle	T2
16	MON	06.05.2024	5		X-ray - Radiography - ultrasonic	T2
	TUE	07.05.2024	3,4		Case studies in testing of welded joints and castings.	T2

COURSE DELIVERY/INSTRUCTIONAL METHODOLOGIES:

<input checked="" type="checkbox"/> Chalk & Talk	<input checked="" type="checkbox"/> Stud. Assignments	<input checked="" type="checkbox"/> Web Resources
<input checked="" type="checkbox"/> LCD/Smartboards	<input checked="" type="checkbox"/> Stud. Seminars	<input type="checkbox"/> Add-On Courses

COURSE ASSESSMENT METHODOLOGIES-DIRECT

<input checked="" type="checkbox"/> University (End Semester) Examination	<input checked="" type="checkbox"/> Internal Assessment Tests		
<input checked="" type="checkbox"/> Assignments	<input checked="" type="checkbox"/> Laboratory Practices	<input checked="" type="checkbox"/> Mini/Major Projects	<input checked="" type="checkbox"/> Stud. Seminars
<input type="checkbox"/> Viva Voce	<input type="checkbox"/> Certifications	<input type="checkbox"/> Add-On Courses	<input type="checkbox"/> 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

<input checked="" type="checkbox"/> Assessment of CO (By Feedback, Once)	<input checked="" type="checkbox"/> Student Feedback On Faculty (Once)
<input type="checkbox"/> Assessment of Mini/Major projects by Ext. Experts	<input type="checkbox"/> 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.

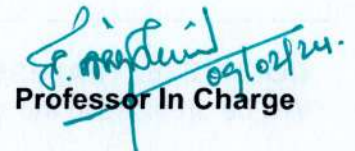
COURSE ADDITIONAL INFORMATION

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