

GOVERNMENT POLYTECHNIC JAIPUR
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DEPARTMENT OF METALLURGICAL ENGG.

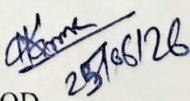
Discipline: Metallurgy	Semester: 5th	Name of the Teaching faculty: Rakesh Kumar Sahu
Subject: TH(3A) Advanced Materials	No of Days/Week class allotted: 3	Semester From Date: 01/07/26 To Date: 05/11/26 No of weeks: 15
Week	Class Day	Topics
1st	1 st	Module 1: Introduction to Advanced Materials - Definition and classification of advanced materials.
	2 nd	The driving forces behind advanced materials research and development.
	3 rd	Comparison between conventional and advanced materials
2nd	1 st	Applications of advanced materials in various fields (aerospace, automotive, electronics, biomedical, etc.)
	2 nd	Module 2: Metallic Advanced Materials & Applications
	3 rd	High-performance alloys (Nickel -based alloys)
3rd	1 st	Titanium, and Cobalt-based alloys
	2 nd	Corrosion Resistant Alloys: Stainless Steels(304,316)
	3 rd	Magnesium-aluminum alloys (5000 Series (e.g., 5052, 5083), Cobalt-Based Alloy
4th	1 st	Class Test-1
	2 nd	Superalloys: Types
	3 rd	manufacturing methods (Directionally solidified casting, Single-crystal casting)
5th	1 st	Properties, and applications of Super Alloys
	2 nd	Shape Memory Alloys (SMA) – Nitinol
	3 rd	Cu-Al-Ni alloys
6th	1 st	Metallic Glasses (Amorphous Metals): Formation and properties of metallic glasses,
	2 nd	Applications of metallic glasses
	3 rd	Doubt clearing class on Module-1 & 2
7th	1 st	Module 3: Polymer Matrix Composites & Ceramic Matrix Composites
	2 nd	Introduction to Polymers and types
	3 rd	Polymer Matrix Composites (PMCs): Manufacturing techniques
8th	1 st	Properties and applications of PMCs.
	2 nd	Introduction to ceramics
	3 rd	Types of reinforcing fibers (glass, carbon, aramid)
9th	1 st	Ceramic Matrix Composites (CMCs): Reinforcement of ceramic matrices with fibers or particles.
	2 nd	High-temperature applications of CMCs.

	3 rd	Doubt clearing class on Module-3
10th	1 st	Class Test-2
	2 nd	Module 4: Nanomaterials, Smart Materials & Emerging Trends in Advanced Materials
	3 rd	Nanomaterials: Introduction to Nanomaterials
11th	1 st	Classification of nanomaterials (0D, 1D).
	2 nd	Classification of nanomaterials (2D, 3D)
	3 rd	Synthesis method for 0D & 1D - nanomaterials.
12th	1 st	Synthesis method for 2D & 3D -nanomaterials.
	2 nd	Carbon Nanotubes (CNTs) and Graphene: Structure
	3 rd	Properties, and applications of CNTs and graphene.
13th	1 st	Smart Materials: Definition and classification of smart materials.
	2 nd	Piezoelectric Materials: o Piezoelectric effect and applications.
	3 rd	Energy storage materials (batteries, fuel cells).
14th	1 st	Materials for sustainable development.
	2 nd	Doubt clearing class on Module-4
	3 rd	Important question & answer discussion
15th	1 st	Question bank discussion & doubt clearing
	2 nd	Very Similar Test(VST)-1 to Semester questions
	3 rd	Very Similar Test(VST)-2 to Semester questions

Course Outcomes(COs): After completion of the course, the students will be able to:

1. Know the classification and significance of advanced materials used in modern industries, including metals, ceramics, polymers, and composites.
2. Analyse the properties, processing techniques, and applications of corrosion-resistant alloys, super alloys, and nanomaterials.
3. Explain the classification and properties of advanced materials such as super alloys, smart materials, and composites

Ramesh M. Samu
Dt. 23/6/26
Course Co-ordinator
Metallurgical Engg.


HOD
Metallurgical Engg.