

# GOVT. POLYTECHNIC NAYAGARH

## DEPARTMENT OF MECHANICAL ENGINEERING

### LESSON PLAN

SUBJECT: MATERIAL SCIENCE & ENGINEERING (TH-3)

SEMESTER: 3<sup>rd</sup>

PERIODS: 3P/WEEK

NAME OF FACULTY: ABINAS NAYAK, LECTURER STAGE I

SEMESTER FROM :14/07/2025 to 15/11/2025

NO. OF WEEKS: 15

Sl. No.	Week	Day	Topics To Be Covered
1	1 <sup>st</sup>	1 <sup>st</sup> day	UNIT-I: Crystal structures and Bonds
		2 <sup>nd</sup> day	Unit cell and space lattice, Crystal systems
		3 <sup>rd</sup> day	Crystal structure: BCC, FCC and HCP
Sl. No.	Week	Day	Topics To Be Covered
2	2 <sup>nd</sup>	1 <sup>st</sup> day	Coordination number for SC, BCC and FCC
		2 <sup>nd</sup> day	Atomic radius: definition and calculations
		3 <sup>rd</sup> day	Atomic Packing Factor for SC, BCC, FCC and HCP
Sl. No.	Week	Day	Topics To Be Covered
3	3 <sup>rd</sup>	1 <sup>st</sup> day	Simple problems on number of atoms in a unit cell
		2 <sup>nd</sup> day	Classification of bonds: primary & secondary
		3 <sup>rd</sup> day	Types of primary bonds: Ionic, Covalent, Metallic
Sl. No.	Week	Day	Topics To Be Covered
4	4 <sup>th</sup>	1 <sup>st</sup> day	Types of secondary bonds
		2 <sup>nd</sup> day	UNIT-II: Phase diagrams, Ferrous metals
		3 <sup>rd</sup> day	Isomorphs, eutectic and eutectoid systems
Sl. No.	Week	Day	Topics To Be Covered
5	5 <sup>th</sup>	1 <sup>st</sup> day	Iron-Carbon binary diagram
		2 <sup>nd</sup> day	Flow sheet for production of iron and steel
		3 <sup>rd</sup> day	Pig iron: classification, composition, impurities
Sl. No.	Week	Day	Topics To Be Covered
6	6 <sup>th</sup>	1 <sup>st</sup> day	Cast Iron: classification, composition, properties, uses
		2 <sup>nd</sup> day	Wrought Iron: properties and uses
		3 <sup>rd</sup> day	Comparison of CI, Wrought Iron, Mild & High C Steel
Sl. No.	Week	Day	Topics To Be Covered
7	7 <sup>th</sup>	1 <sup>st</sup> day	Standard commercial grades of steel (BIS, AISI)
		2 <sup>nd</sup> day	Alloy Steels – purpose & effects of alloying elements
		3 <sup>rd</sup> day	Important alloy steels: Si steel, HSS

Sl. No.	Week	Day	Topics To Be Covered
8	8 <sup>th</sup>	1 <sup>st</sup> day	Heat resisting steel, spring steel
		2 <sup>nd</sup> day	Stainless Steel: types and applications
		3 <sup>rd</sup> day	UNIT-III: Non-ferrous metals and its Alloys
Sl. No.	Week	Day	Topics To Be Covered
9	9 <sup>th</sup>	1 <sup>st</sup> day	Properties and uses of Al, Cu, Sn, Pb, Zn, Mg, Ni
		2 <sup>nd</sup> day	Copper alloys: Brasses – composition, properties, uses
		3 <sup>rd</sup> day	Copper alloys: Bronzes – composition, properties, uses
Sl. No.	Week	Day	Topics To Be Covered
10	10 <sup>th</sup>	1 <sup>st</sup> day	Aluminum alloys: Duralumin, Hindalium
		2 <sup>nd</sup> day	Nickel alloys: Inconel, Monel
		3 <sup>rd</sup> day	Anti-friction/Bearing alloys & BIS/ASME grades
Sl. No.	Week	Day	Topics To Be Covered
11	11 <sup>th</sup>	1 <sup>st</sup> day	UNIT-IV: Failure analysis & Testing
		2 <sup>nd</sup> day	Fracture: ductile fracture, brittle fracture
		3 <sup>rd</sup> day	Fatigue, endurance limit, creep
Sl. No.	Week	Day	Topics To Be Covered
12	12 <sup>th</sup>	1 <sup>st</sup> day	Destructive testing: Tensile, compression testing
		2 <sup>nd</sup> day	Hardness testing: Brinell, Rockwell
		3 <sup>rd</sup> day	Bend test, torsion test, fatigue test
Sl. No.	Week	Day	Topics To Be Covered
13	13 <sup>th</sup>	1 <sup>st</sup> day	Non-destructive testing: Visual, Magnetic particle
		2 <sup>nd</sup> day	Liquid penetrant test, Ultrasonic inspection
		3 <sup>rd</sup> day	Radiography
Sl. No.	Week	Day	Topics To Be Covered
14	14 <sup>th</sup>	1 <sup>st</sup> day	UNIT-V: Corrosion & Surface Engineering
		2 <sup>nd</sup> day	Nature of corrosion, Electro chemical reactions
		3 <sup>rd</sup> day	Types of corrosion & corrosion control methods
Sl. No.	Week	Day	Topics To Be Covered
15	15 <sup>th</sup>	1 <sup>st</sup> day	Surface engineering: Coatings & treatments
		2 <sup>nd</sup> day	Electroplating, PVD, CVD
		3 <sup>rd</sup> day	Doubt clearance and Revision

#### References:

1. Material Science-R.S.Khurmi,R.S.Sedha-S.Chand,Publication
2. Material Science and Metallurgy –D.S.Nutt-S.K.Katariya and Sons,New Delhi
3. Material Science and Engineering -V.Raghavan-EEE Edition, Prentice Hall, New Delhi

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