

GOVT POLYTECHNIC MAYURBHANJ, TIKARPADA

LESSON PLAN OF HEAT TREATMENT ACADEMIC YEAR (2026-2027) WINTER

DISCIPLINE: METALLURGY ENGINEERING		SEMESTER: 5TH	NAME OF THE TEACHING FACULTY: SODASHIV PATRA
SUBJECT: HEAT TREATMENT, COURSE CODE: MTPC303		NO OF DAYS/PER WEEK CLASS ALLOTTED:03	SEMESTER FROM DATE:01.07.2026, TO DATE:05.11.2026, NO OF WEEKS: 16
WEEK	CLASS NO	UNITS	LECTURE TOPICS
1	1	CHAPTER -1 FUNDAMENTALS OF HEAT TREATMENT AND PHASE TRANSFORMATIONS	INTRODUCTION CLASS
	2		DEFINITION, OBJECTIVES, AND INDUSTRIAL APPLICATIONS OF HEAT TREATMENT
	3		PHASE DIAGRAMS WITH EMPHASIS ON THE IRON-CARBON SYSTEM
2	4		CRITICAL TEMPERATURES (A1, A3, ACM) AND THEIR METALLURGICAL SIGNIFICANCE
	5		PHASE TRANSFORMATIONS: DIFFUSION, INTRODUCTION TO DIFFUSION, FICK'S LAW
	6		THE FORMATION OF AUSTENITE, THE MECHANISM OF FORMATION OF AUSTENITE, AUSTENITIC GRAIN SIZE. THE METHODS OF DETERMINATION OF AUSTENITIC GRAIN SIZE, THE IMPORTANCE OF GRAIN SIZE, THE METHOD OF MEASUREMENT OF GRAIN SIZE, THE METHODS OF CONTROL AUSTENITIC GRAIN SIZE, DECOMPOSITION OF AUSTENITE AND PEARLITIC TRANSFORMATION
3	7		THE PROCESS OF CONSTRUCTION OF T-T-T DIAGRAM AND CCT DIAGRAM, THE TTT & CCT DIAGRAM FOR HYPO EUTECTOID, EUTECTOID AND HYPER EUTECTOID STEEL, BAINITIC TRANSFORMATION, MARTENSITIC TRANSFORMATION.
	8		REVISION
	9		DOUBT CLEARING CLASS
4	10	CHAPTER -2 HEAT TREATMENT PROCESSES FOR FERROUS, NON-FERROUS ALLOYS AND SPECIAL HEAT TREATMENT TECHNIQUES	ABOUT HEAT TREATMENT PROCESSES
	11		ANNEALING: FULL, PROCESS, STRESS-RELIEF, AND SPHEROIDIZING, TEMPERATURE RANGE
	12		NORMALIZING: OBJECTIVES AND MICROSTRUCTURAL CHANGES, TEMPERATURE RANGE
5	13		HARDENING: OBJECTIVES AND MICROSTRUCTURAL CHANGES, TEMPERATURE RANGE, FACTORS AFFECTING HARDENING PROCESS, QUENCHING MEDIA
	14		TEMPERING: PURPOSE, MECHANISMS, AND EFFECTS OF TEMPERING TEMPERATURE
	15		THERMOMECHANICAL PROCESSING (TMP): PRINCIPLES AND APPLICATIONS
6	16		SPECIAL PROCESSES: AUSTEMPERING, MARTEMpering, CRYOGENIC TREATMENT
	17		HEAT TREATMENT OF NON-FERROUS ALLOYS (ALUMINUM, COPPER, TITANIUM ALLOYS)
	18		REVISION
7	19		THERMOMECHANICAL PROCESSING (TMP): PRINCIPLES AND APPLICATIONS
	20		HARDENING: OBJECTIVES AND MICROSTRUCTURAL CHANGES, TEMPERATURE RANGE, FACTORS AFFECTING HARDENING PROCESS, QUENCHING MEDIA
	21		SPECIAL PROCESSES: AUSTEMPERING, MARTEMpering, CRYOGENIC TREATMENT

8	22		HARDENING: OBJECTIVES AND MICROSTRUCTURAL CHANGES, TEMPERATURE RANGE, FACTORS AFFECTING HARDENING PROCESS, QUENCHING MEDIA
	23		HEAT TREATMENT OF NON-FERROUS ALLOYS (ALUMINUM, COPPER, TITANIUM ALLOYS)
	24		TEMPERING: PURPOSE, MECHANISMS, AND EFFECTS OF TEMPERING TEMPERATURE
9	25		REVISION
	26		DOUBT CLEARING CLASS
	27		SURPRISE TEST
10	28	CHAPTER -3 HARDENABILITY, SURFACE HARDENING	IMPORTANCE OF HARDNESS & HARDENABILITY, THE METHOD OF DETERMINATION OF HARDENABILITY (GROSS MAN'S CRITICAL DIAMETER METHOD & JOMINEY END QUENCH METHOD), THE FACTORS AFFECTING HARDENABILITY, EFFECT OF AUSTENITIC GRAIN SIZE, CARBON CONTENT, AND ALLOYING ELEMENTS
	29		SURFACE HARDENING TECHNIQUES: OBJECTIVES OF SURFACE HARDENING, THE METHODS OF CASE DEPTH MEASUREMENT OF STEEL, CARBURIZING: PACK CARBURIZING, LIQUID CARBURIZING, GAS CARBURIZING
	30		NITRIDING, CYANIDING, CARBONITRIDING
11	31		POST CARBURIZING HEAT TREATMENT.
	32		ADVANCED TECHNIQUES: INDUCTION HARDENING, FLAME HARDENING, LASER HARDENING
	33		REVISION
12	34	CHAPTER -4 HEAT TREATMENT EQUIPMENT, DEFECTS, QUALITY CONTROL & INDUSTRIALLY IMPORTANT SPECIAL STEELS	DOUBT CLEARING CLASS
	35		SURPRISE TEST
	36		HEAT TREATMENT FURNACES: BOX, PIT, SALT BATH, AND VACUUM FURNACES
13	37		FURNACE ATMOSPHERES: NEUTRAL, CARBURIZING, AND NITRIDING ATMOSPHERES
	38		HEAT TREATMENT DEFECTS: DISTORTION, CRACKING, DECARBURIZATION (CAUSES & REMEDIES)
	39		SPECIAL STEELS: BASIC IDEA, CONSISTING OF ELEMENTS, PROPERTIES AND REAL-WORLD APPLICATION OF TOOL STEELS, STAINLESS STEELS (AUSTENITIC (304, 316), FERRITIC (430), MARTENSITIC (410, 420), DUPLEX (2205), HIGH-STRENGTH LOW-ALLOY (HSLA) STEELS, MARAGING STEELS, BEARING STEELS, ELECTRICAL STEELS (SILICON STEELS
14	40		CREEP- RESISTANT STEELS (HEAT-RESISTANT STEELS), DUPLEX AND SUPER DUPLEX STAINLESS STEELS, HADFIELD MANGANESE STEEL (HIGH-MN STEEL), TRIP AND TWIP STEELS (ADVANCED HIGH-STRENGTH STEELS – AHSS)
	41		HEAT TREATMENT FURNACES: BOX, PIT, SALT BATH, AND VACUUM FURNACES
	42		FURNACE ATMOSPHERES: NEUTRAL, CARBURIZING, AND NITRIDING ATMOSPHERES
15	43		HEAT TREATMENT DEFECTS: DISTORTION, CRACKING, DECARBURIZATION (CAUSES & REMEDIES)
	44		ABOUT HEAT TREATMENT EQUIPMENT
	45		BASIC IDEA, CONSISTING OF ELEMENTS, PROPERTIES AND REAL-WORLD APPLICATION OF TOOL STEELS, STAINLESS STEELS

16	46		REVISION
	47		DOUBT CLEARING CLASS
	48		SURPRISE TEST

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