LESSON PLAN: TH-1 – MANUFACTURING PROCESSES (MEPC201)

Academic Session: 2026-27

Department	Mechanical Engineering	**Name of the Teaching Faculty**	SATYANARAYAN TRIPATHY	**Semester**	3RD
No. of Week	15	**Total Classes**	45	**No. of Days/Week Class Allotted**	3
Subject (TH1)	MANUFACTURING PROCESSES	**Course Code**	MEPC201	**Theory Hours**	45
Academic Period	13-07-2026 to 05-11-2026	**Class Pattern**	Monday, Tuesday & Thursday – 1 period each	**Credit**	3

WEEK	DAYS / WEEK	CLASS / DATE	THEORY TOPICS / ASSESSMENT
Week 1	3		
		1st	[Unit I] Cutting fluids and lubricants: introduction; types of cutting fluids and coolants required in turning, drilling, shaping, sawing and broaching.
		2nd	[Unit I] Selection of cutting fluids; methods of application of cutting fluid; classification of lubricants—solid, liquid and gaseous.
		3rd	[Unit I] MAKE-UP CLASS: Properties and applications of lubricants; selection of lubricants for machining operations.
Week 2	3		
		4th	[Unit I] Lathe operation: types of lathes—light duty, medium duty and heavy duty; geared lathe.
		5th	[Unit I] CNC lathe: specifications; basic parts and their functions; operations and tools.
		6th	[Unit I] Lathe operations: turning, parting-off, knurling, facing, boring and drilling.
Week 3	3		
		7th	[Unit I] Lathe operations: threading, taper turning, nomenclature of single-point cutting tool.
		8th	[Unit I] Selection and application of cutting tools, lubricants and coolants in lathe operations.
		9th	[Unit I] Lathe tool geometry and basic machining practice; comparison of conventional and CNC lathe.
Week 4	3		
		10th	[Unit I] Unit-I revision and examination-oriented questions.
		11th	[Unit II] Broaching machines: introduction to broaching; horizontal type—single ram and duplex ram.
		12th	[Unit II] Vertical broaching machines: pull down and push down types; elements of broaching machine.
Week 5	3		
		13th	[Unit II] Broach tooth details; nomenclature; tool material.
		14th	[Unit II] Drilling: classification; basic parts and their functions; radial drilling machine.
		15th	[Unit II] Types of drilling machines; operations and specifications of drilling machines.
Week 6	3		
		16th	[Unit II] Selection of drilling machine and cutting tools for different drilling operations.
		17th	[Unit II] Comparison of broaching and drilling processes; applications and process selection.
		18th	[Unit II] MAKE-UP CLASS: Broaching and drilling machine tooling, operating parameters and safety considerations.
Week 7	3		
		19th	[Unit II] Unit-II revision and application-based questions.
		20th	[Unit III] Welding: classification; gas welding techniques; types of welding flames.
		21st	[Unit III] Arc welding: principle, equipment and applications.
Week 8	3		
		22nd	[Unit III] Shielded metal arc welding; submerged arc welding.
		23rd	[Unit III] TIG and MIG welding; principles and applications.
		24th	[Unit III] Resistance welding: spot welding, seam welding and projection welding.
Week 9	3		
		25th	[Unit III] Welding defects: types, causes and remedies.
		26th	[Unit III] Brazing and soldering: types, principles and applications.
		27th	[Unit III] Milling machine: introduction; types of milling machines; principle and applications.
Week 10	3		
		28th	[Unit III] Milling machine specifications; milling operations—simple, compound and differential indexing; milling cutters, nomenclature and tool materials; work-holding devices.
		29th	[Unit IV] Gear making: manufacture of gears by casting, moulding, stamping, coining, extruding and rolling.
		30th	[Unit IV] Gear making by machining: gear generating methods; gear shaping with pinion cutter and rack cutter.
Week 11	3		
		31st	[Unit IV] Gear hobbing: description and operation of gear

			hobbing machine.
		32nd	[Unit IV] Gear finishing process; gear materials; gear specifications; heat treatment processes applied to gears.
		33rd	[Unit IV] Press working: types of presses and specifications; cutting, bending and drawing.
Week 12	3		
		34th	[Unit IV] Press working operations: punching, blanking, notching, lancing, piercing and shearing.
		35th	[Unit IV] Press tools: die-set components, punch and die; guide pin, bolster plate, stripper and stock guide.
		36th	[Unit IV] Feed stock, pilot, punch and die clearances; applications of press working.
Week 13	3		
		37th	[Unit IV] Unit-IV revision and application-based questions.
		38th	[Unit V] Grinding and finishing processes: principles of metal removal by grinding; abrasives—natural and artificial; bonds and bonding processes.
		39th	[Unit V] Vitrified, silicate, shellac, rubber and resin bonds; factors affecting selection of grinding wheel.
Week 14	3		
		40th	[Unit V] Grinding wheel: size and shape; kind of abrasive; grain size; grade and strength of bond; structure of grain; spacing; kinds of bond material.
		41st	[Unit V] Standard marking system; meaning and number sequence of makers; grades of letters.
		42nd	[Unit V] Grinding machines: cylindrical, surface, tool and cutter grinding machines; construction and details.
Week 15	3		
		43rd	[Unit V] Principle of centreless grinding; advantages and limitations; centreless grinding by through-feed and plunge-feed.
		44th	[Unit V] Finishing by grinding, honing, lapping and super-finishing; electroplating—basic principles, plating metals and applications.
		45th	[Unit V] Electroplating and surface treatment: galvanizing, tin coating, parkerizing, anodizing; metal spraying and organic coating—oil-base paint, lacquer, base enamels, bitumen paint; rubber base coating; finishing operations.

SIGNATURE OF FACULTY
SATYANARAYAN TRIPATHY

LESSON PLAN OF MECHANICAL ENGINEERING DEPARTMENT WINTER 2026

Department: Mechanical Engineering		Name of the Teaching Faculty: DEBASHISH BISI	
No of Week: 15 (1st July to 5th November 2026)	**No of Days/Week Class Allotted**	**Semester : 3rd**	**Subject (Th-2): Strength of Material**
WEEK		**CLASS**	**THEORY TOPICS**
Week 1	3	1st	**CH.1 Simple Stresses and Strains:** Types of forces
		2nd	Stress, Strain and their nature
		3rd	Mechanical properties of common engineering materials
Week 2	3	4th	Significance of various points on stress – strain diagram for M.S. specimens
		5th	Significance of various points on stress – strain diagram for C.I. specimens
		6th	Significance of factor of safety
Week 3	3	7th	Elastic constants. Relation between elastic constants
		8th	Stress and strain values in bodies of uniform section under the influence of normal forces
		9th	Stress and strain values in bodies of of composite section under the influence of normal forces
Week 4	3	10th	Thermal stresses in bodies of uniform section& composite sections
		11th	Related numerical problems on the above topics.
		12th	**Strain Energy:** Strain energy or resilience, proof resilience and modulus of resilience; Derivation of Strain energy for the Gradually applied load,
Week 5	3	13th	Derivation of Strain energy for the Suddenly applied load , Impact/ shock load
		14th	Related numerical problems
		15th	**CH.2 Shear Force & Bending Moment Diagrams:** Types of beams with examples: a)Cantilever beam, b)Simply supported beam, c)Overhanging beam, d)Continuous beam, e) Fixed beam; Types of Loads – Point load, UDL and UVL
Week 6	3	16th	Definition and explanation of shear force and bending moment; Calculation of shear force and bending moment
		17th	Drawing the S.F and B.M. diagrams by the analytical method only for Cantilever with point loads and uniformly distributed load
		18th	Drawing the S.F and B.M. diagrams by the analytical method only for Simply supported beam with point loads, UDL
Week 7	3	19th	Drawing the S.F and B.M. diagrams by the analytical method only for Cantilever with point loads,
		20th	Drawing the S.F and B.M. diagrams by the analytical method Overhanging beam with point loads at the centre & at free ends,
		21st	Drawing the S.F and B.M. diagrams by the analytical method Over hanging beam with UDL throughout Combination of point and UDL for the above
Week 8	3	22nd	Related numerical problems.
		23rd	**CH.3. Theory of Simple Bending and Deflection of Beams:** Explanation of terms: Neutral layer, Neutral Axis, Modulus of Section, Moment of Resistance, Bending stress, Radius of curvature
		24th	Assumptions in theory of simple bending, Bending Equation M/I =σ/Y=E/R with derivation

Week 9	3	25th	Problems involving calculations of bending stress, modulus of section and moment of resistance
		26th	Calculation of safe loads and safe span and dimensions of cross-section
		27th	Deflection formulae without proof for cantilever and simply supported beams with point load & UDL only (Standard cases only)
Week10	3	28th	Related numerical problems.
		29th	**Ch iv. Torsion in Shafts and Springs:** Definition and function of shaft
		30th	Calculation of polar M.I. for solid shafts
Week11	2	31st	Calculation of polar M.I. for hollow shafts
		32nd	Assumptions in simple torsion.
		33rd	Derivation of the equation $T/J=f_s/R= G\theta/L$
Week12	3	34th	Problems on design of shaft based on strength and rigidity
		35th	Numerical Problems related to comparison of strength and weight of solid and hollow shafts
		36th	Classification of springs. Nomenclature of closed coil helical spring,
Week13	3	37th	Deflection formula for closed coil helical spring (without derivation). stiffness of spring
		38th	Numerical problems on closed coil helical spring to find safe load, deflection, size of coil and number of coils.
		39th	Numerical problems on closed coil helical spring to find safe load, deflection, size of coil and number of coils.
Week14	3	40th	**Unit-V: Thin Cylindrical Shells:** Explanation of longitudinal and hoop stresses in the light of circumferential and longitudinal failure of shell;
		41st	Derivation of expressions for the Longitudinal and hoop stress for seamless shells
		42nd	Derivation of expressions for the Longitudinal and hoop stress for seam shells
Week15	3	43rd	Related numerical Problems for safe thickness and safe working pressure
		44th	Doubt clearing of all topics of subject
		45th	Doubt clearing of all topics of subject
Total class =		45	

23/06/26

Debashish Bisi
Senior Lecturer (Mech.)
GCPES, Berhampur

LESSON PLAN: TH-3 – MATERIAL SCIENCE & ENGINEERING (MEPC205)

Academic Session: 2026-27

Department	Mechanical Engineering	Name of the Teaching Faculty	SATYANARAYAN TRIPATHY	Semester	3RD
No. of Week	15	Total Classes	45	No. of Days/Week Class Allotted	3
Subject (TH-3)	MATERIAL SCIENCE & ENGINEERING	Course Code	MEPC205	Theory Hours	45
Academic Period	13-07-2026 to 05-11-2026	Class Pattern	Thursday – 1 period; Friday – 2 periods	Credit	3

WEEK	DAYS / WEEK	CLASS / DATE	THEORY TOPICS / ASSESSMENT
Week 1	3		
		1st	[I] Crystal structures and Bonds: Unit cell and space lattice; seven crystal systems.
		2nd	[I] Crystal structure of metallic elements: BCC, FCC and HCP; coordination number for simple cubic, BCC and FCC.
		3rd	[I] MAKE-UP CLASS: Atomic radius: definition and relations for simple cubic, BCC and FCC; atomic packing factor for simple cubic, BCC and HCP.
Week 2	3		
		4th	[I] Simple problems on finding number of atoms for a unit cell; atomic packing factor and related numericals.
		5th	[I] Bonds in solids: classification—primary/chemical and secondary/molecular bonds; types of primary bonds.
		6th	[I] Primary bonds: ionic bond, covalent bond and metallic bond; characteristics and examples.
Week 3	3		
		7th	[I] Secondary bonds: dipole bond and hydrogen bond; comparison of primary and secondary bonds.
		8th	[I] Revision of crystal systems, BCC/FCC/HCP, coordination number, atomic radius and atomic packing factor.
		9th	[I] Problem-solving and application of crystal structures and bonding in engineering materials.
Week 4	3		
		10th	[I] Unit-I revision and important examination questions.
		11th	[II] Phase diagrams: isomorphous, eutectic and eutectoid systems; iron-carbon binary diagram.
		12th	[II] Iron-carbon binary diagram: phases, critical points and important regions.
Week 5	3		
		13th	[II] Flow sheet for production of iron and steel; iron ores and pig iron.
		14th	[II] Pig iron: classification, composition and effects of impurities in iron; cast iron classification.
		15th	[II] Cast iron: properties and applications; wrought iron: properties and applications.
Week 6	3		
		16th	[II] Comparison of wrought iron and mild steel; standard commercial grades of steel as per BIS and AISI.
		17th	[II] Alloy steels: purpose of alloying elements and effects of important alloying elements.
		18th	[II] Special steels: silicon steel, high-speed steel (HSS), heat-resisting steel and spring steel.
Week 7	3		
		19th	[II] Stainless steel: types, applications and magnetic steel; composition and properties.
		20th	[III] Non-ferrous metals and alloys: properties and uses of aluminium, copper, tin, lead, zinc, magnesium and nickel.
		21st	[III] MAKE-UP CLASS: Copper alloys: brass and bronze—composition, properties and uses.
Week 8	3		
		22nd	[III] Aluminium alloys: duralumin, hindalium and magnalium—composition, properties and uses.
		23rd	[III] Magnesium alloys: composition, properties and uses.
		24th	[III] Nickel alloys: inconel, monel, nicrome and permalloy—composition, properties and uses.
Week 9	3		
		25th	[III] Anti-friction/bearing alloys: various types of bearing bronzes and related bearing materials.
		26th	[III] MAKE-UP CLASS: Comparison and selection of non-ferrous metals and alloys for engineering applications.
		27th	[III] Standard commercial grades and typical engineering uses of non-ferrous alloys.
Week 10	3		
		28th	[III] Unit-III revision and application-based questions.
		29th	[IV] Failure analysis & testing of materials: introduction to failure analysis; fracture—ductile and brittle fracture.
		30th	[IV] Cleavage and fracture characteristics; basic mechanisms of fracture.
Week 11	3		

		31st	[IV] Fatigue failure: introduction, endurance limit and characteristics of fatigue fracture.
		32nd	[IV] Variables affecting fatigue life; creep, creep curve and creep fracture.
		33rd	[IV] Destructive testing: tensile test and compression test; purpose and procedure.
Week 12	3		
		34th	[IV] MAKE-UP CLASS: Impact testing: Izod and Charpy tests; significance and comparison.
		35th	[IV] Hardness testing: Brinell, Rockwell and Vickers tests; comparison and applications.
		36th	[IV] Non-destructive testing: visual inspection and magnetic particle inspection.
Week 13	3		
		37th	[IV] Liquid penetrant testing, ultrasonic testing and radiography; advantages and limitations.
		38th	[V] Corrosion: nature of corrosion and its causes; electrochemical reactions and electrolytes.
		39th	[V] Factors affecting corrosion: environment, material properties and physical conditions.
Week 14	3		
		40th	[V] Types of corrosion; corrosion control by material selection, environmental control and design.
		41st	[V] Surface engineering: principles and purpose; cleaning and mechanical finishing of surfaces.
		42nd	[V] Organic coatings; electroplating and special metal plating; electropolishing.
Week 15	3		
		43rd	[V] MAKE-UP CLASS: Conversion coatings: oxide, phosphate and chromate coatings; applications.
		44th	[V] Thin-film coatings: PVD and CVD; surface analysis; hard-facing and thermal spraying.
		45th	[V] High-energy surface processes; selection of surface-engineering processes; final unit revision.

SIGNATURE OF FACULTY
SATYANARAYAN TRIPATHY

LESSON PLAN OF MECHANICAL ENGINEERING DEPARTMENT WINTER 2026

Discipline: Mechanical	Semester: 3RD	Name of Faculty: Sushri Priyanka Panigrahi	
Subject: TH:4- FLUID MECHANICS & FLUID POWER	No of Days per week class allotted	Semester From: 1st July 2026 to 5th November 2026	
Week	**Class No**	**Class days**	**Chapter**	**Theory Topic**
1st	1	1st	1	**PROPERTIES OF A FLUID AND HYDROSTATICS:** Definition of a fluid, classification of fluids, various fluid properties such as density, specific weight, specific gravity
	2	2nd		viscosity and surface tension and state the units
	3	3rd		principle of buoyancy and floatation
2nd	4	4th		working of various measuring devices for pressure,
	5	5th		The principle of manometers of simple, differential and inverted types
	6	6th		Simple numericals on Manometer.
3rd	7	7th		fluid pressure, total pressure (hydrostatic force) and
	8	8th		location of centre of pressure on vertical, horizontal ,
	9	9th		location of centre of pressure on inclined and curved surfaces by fluid
4th	10	10th	2	**KINEMATICS AND DYNAMICS OF FLUID MECHANICS:** Various types of flow, circulation and vorticity, stream-line, path line and streak-line
	11	11th		various energies of fluid, law of conservation of mass, energy equation -
	12	12th		Bernoulli's theorem, the limitations of same-application of Bernoulli's equation
5th	13	13th		the working of venturimeter, equation of flow rate and velocity with respect to venturimeter
	14	14th		the working of pitot tube, equation of flow rate and velocity with respect to pitot tube
	15	15th		the working of flowmeter: current meter, Simple numericals.
6th	16	16th	3	**FLOW THROUGH ORIFICES AND NOTCHES, PIPES:** orifice, orifice coefficient such as Cc, Cv, Cd, Relationship between orifice coefficients
	17	17th		weir and notch, Discharge over rectangular notch and weir
	18	18th		triangular notch. Simple numericals
7th	19	19th		Definition of a pipe. laws of fluid friction
	20	20th		Equation of loss of head through pipe due to friction, Darcy's formula and Chezy's formula
	21	21st		hydraulic gradient and total energy line
8th	22	22nd		Nozzle and its application, Power transmission through nozzle
	23	23rd		The condition of maximum power transmission through nozzle
	24	24th		Expression for diameter of nozzle for maximum power transmission
9th	25	25th		**Turbines and Pumps:** Classification of hydraulic turbines, Selection of turbine on the basis of head and discharge available
	26	26th		Construction and working principle of Pelton wheel turbine
	27	27th		Construction and working principle of Francis turbines

10th	28	28th	4	Construction and working principle of Kaplan turbines
	29	29th		Draft tubes – types and construction
	30	30th		Concept of cavitation in turbines
11th	31	31st		Calculation of Work done, Power, efficiency of turbines
	32	32nd		Centrifugal Pumps: Principle of working and applications, Types of casings and impellers
	33	33rd		Concept of multistage, Priming and its methods, Manometric head
12th	34	34th		Work done, Manometric efficiency, Overall efficiency. Simple numericals
	35	35th		Reciprocating Pumps: Construction, working principle and applications of single and double acting reciprocating pump
	36	36th		Concept of Slip, Negative slip, Cavitation and separation. Simple numericals
13th	37	37th	5	**FLUID POWER:** Definition of fluid power, classification – hydraulic power and pneumatic power,
	38	38th		Hydraulic Systems -Basic principle of enclosed hydraulic system – Pascal's law, Oil hydraulic system – reservoir, filter pressure limiting valves, d
	39	39th		Direction control valves, flow control valves, actuators (linear and rotary)
14th	40	40th		accumulator, pipes and fittings,
	41	41st		various positive displacement pumps-gear, vane, piston,
	42	42nd		drawing of hydraulic circuits - extension and retraction of linear actuator, motion of rotary actuator, holding a job, hydraulic press etc.
15th	43	43rd		Drawing of hydraulic circuits - motion of rotary actuator
	44	44th		Drawing of hydraulic circuits - holding a job, hydraulic press etc.
	45	45th		Semester and Question Bank discussion

Panigrahi 23/06/26

Sushri Priyanka Panigrahi
Sr. Lect, Mechanical

LESSON PLAN FOR ADVANCE MANUFACTURING PROCESS FOR AY -2026-2027 UNDER 3RD SEMESTER (2nd YEAR)

Discipline: **MECHANICAL ENGG.**	Semester:**3RD**	Name of the Teaching Faculty : **SRI PRIYABRATA PANDA**
Subject: **THERMAL ENG. - I (ME PC209)**	No. of Days/per week class allotted:3P /W	Semester From Date:**01.07.2026** To Date:**05.11.2026** No. of Weeks:15 WeekS
Week	**ClassDay**	**Theory /Topics**
1ST	1st	**Introduction to Thermodynamics** Thermodynamic Systems (closed, open, isolated).
	2nd	Thermodynamic properties of a system (pressure, volume, temperature, entropy, enthalpy, Internal energy and units of measurement)
	3rd	Intensive and extensive properties ; Define thermodynamic processes, path, cycle , state, path function, point function.
2ND	1st	Thermodynamic Equilibrium; Quasi-static Process; Laws of thermodynamics (statements only).
	2nd	**Sources of Energy** Brief description of energy Sources: Classification of energy sources: Renewable, Non-Renewable.
	3rd	Fossil fuels (CNG & LPG) ; Solar Energy.
3RD	1st	Flat plate and concentrating collectors & its applications (working principles of Solar Water Heater, Photovoltaic Cell, Solar Distillation).
	2nd	Definitions of Wind Energy; Tidal Energy; Ocean Thermal Energy.
	3rd	Geothermal Energy; Biogas, Biomass, Bio- diesel.
4TH	1st	Hydraulic Energy, Nuclear Energy; Fuel cell.
	2nd	**Internal Combustion Engines** Assumptions made in air standard cycle analysis; Brief description of Carnot.
	3rd	Otto and Diesel cycles with P-V and T-S diagrams.
5TH	1st	Internal and external combustion engines; advantages of I.C. engines over external combustion engines.
	2nd	classification of I.C. engines; neat sketch of I.C. engine indicating component parts.
	3rd	Function of each part and materials used for the component parts - Cylinder, crank case, crank pin, crank, crank shaft.
6TH	1st	Connecting rod, wrist pin, piston, cooling pins cylinder heads, exhaust valve, inlet valve.
	2nd	Working of four-stroke and two stroke petrol and diesel engines.
	3rd	Comparison of two stroke and four stroke engines; Comparison of C.I. and S.I. engines.

7TH	1st	Valve timing and port timing diagrams for four stroke and two stroke engines.
	2nd	**I.C. Engine Systems** Fuel system of Petrol engines; Principle of operation of simple and Zenith carburetors.
	3rd	Fuel system of Diesel engines.
8TH	1st	Types of injectors and fuel pumps.
	2nd	Cooling system: air cooling, water cooling system with thermo siphon method of circulation and water cooling system with radiator and forced circulation (description with line diagram).
	3rd	Comparison of air cooling and water cooling system.
9TH	1st	Ignition systems – Battery coil ignition and magneto ignition (description and working). Comparison of two systems.
	2nd	Types of lubricating systems used in I.C. engines with line diagram.
	3rd	Types of governing of I.C. engines – hit and miss method, quantitative method, qualitative method and combination methods of governing; their applications.
10TH	1st	Objective of super charging.
	2nd	**Performance of I.C.** Engines: Brake power.
	3rd	Indicated power; Frictional power.
11TH	1st	Brake and Indicated mean effective pressures.
	2nd	Brake and Indicated thermal efficiencies.
	3rd	Mechanical efficiency , Relative efficiency.
12TH	1st	Performance test.
	2nd	Morse test; Heat balance sheet.
	3rd	Methods of determination of B,P., I.P. and F.P.
13TH	1st	Simple numerical problems on performance of I.C. engines.
	2nd	**Air Compressors** Functions of air compressor, Uses of compressed air.
	3rd	Types of air compressors, Single stage reciprocating air compressor - its construction and working (with line diagram) using P-V diagram.
14TH	1st	Multi stage compressors – Advantages over single stage compressors.
	2nd	Rotary compressors: Centrifugal compressor, axial flow type compressor and vane type compressors.

15TH	3rd	Refrigeration & Air-conditioning: Refrigeration; Refrigerant; COP.
	1st	Air Refrigeration system: components, working & applications;
	2nd	Vapour Compression system: components, working & applications, Air conditioning, Classification of Air- conditioning systems.
	3rd	Comfort and Industrial Air-Conditioning; Window Air- Conditioner; Summer Air-Conditioning system, Winter Air-Conditioning system, Year-round Air-Conditioning system.

PRIYABRATA PANDA

Priyabrata Panda

LECTURER ST.II

MECHANICAL ENGG. DEPT.