Sant Gadge Baba Amravati University, Amravati Faculty of Science and Technology

Board of Studies in Mechanical Engineering

Program:	**B. E. Mechanical Engineering**	**Semester:**	3
Course:	**ENGINEERING MATERIALS**	**Code:**	3M206OE

Lecture	**Tutorial**	**Hours**	**Credit**	**TA**	**CT-I**	**CT-II**	**Th. Exam**	**Total**
3	0	3	3	40	30	30	60	100

Methods of Teacher Assessment (TA): Class Tests, Assignments, Class Attendance, Quiz

Course Objectives:

I. To gain the knowledge of various materials, their classification & applications.
II. To study the basic mechanical properties of materials
III. To develop a fundamental understanding of various electrical, electronic & magnetic materials.
IV. To study the properties and application of stainless steels.
V. To study the importance of biomaterials and their applications.
VI. To study concepts, advantages, limitations and applications of powder metallurgy

After completion of the course, the student will be able to:

1. Comprehend the importance of materials in engineering and society.
2. Students are able to understand and distinguish between varieties of materials based on their properties.
3. Students will get to know the different classes of materials used in engineering applications and would be able to understand the choice of right materials for specific application.

CO	**Course Outcome**	**BT Level**
CO-1	Define basic concept of process metallurgy, understand classification of material and their applications.	L1, L2
CO-2	Understand the basic mechanical properties of engineering materials and properties and applications of various metals.	L2
CO-3	Explain applications and properties of newer class materials like smart materials, piezoelectric materials, biomaterials, super conducting materials etc.	L3 ,L4
CO-4	Understand and suggest the properties and applications of various stainless steels.	L4, L2
CO-5	Explain features, classification, applications of newer class materials like biomaterials, composite materials etc.	L3, L4
CO-6	Understand the concepts of Powder Metallurgy and its industrial applications.	L2

Syllabus:

UNIT-I: **Introduction to metallurgy**: Basic concept of process metallurgy, physical metallurgy, and mechanical metallurgy, Classification of materials & their application, Solid solutions, types and their formation, Alloy: its importance, list of important alloys and their uses**.** (6 Hrs)

UNIT II: Mechanical properties of materials:
Basic Mechanical Properties of Engineering Materials like Strength, Toughness, Hardenability, Brittleness, Malleability, Ductility, Creep and Slip, Resilience, Fatigue.
Elastic, Inelastic and Viscoelastic behaviour, Stress – Strain Curve for ductile and brittle materials.
General properties and applications Steel, Cast Iron, brass, bronze (6 Hrs)

UNIT III: Electrical, Electronic & Magnetic Materials: Introduction, Classification, Applications and properties of Pyro, Piezo, Ferroelectrics, Extrinsic and Intrinsic semiconductors; super conducting materials. Magnetic materials, Soft and hard magnetic materials and applications. (6 Hrs)

UNIT IV: Stainless Steels
Introduction, Types of Stainless Steel: Ferritic, Martensitic, Austenitic stainless steels and their Properties and applications (6 Hrs)

UNIT V: Biomaterials: Biomaterials definition, classification: metals, ceramics, polymer, composites- advantages, limitations and applications. (6 Hrs)

UNIT VI: **Powder Metallurgy:** Concepts, Advantages, limitations and applications of Powder Metallurgy, Methods of manufacturing of metal powders, Compaction Process, Sintering process. (6 Hrs)

Textbooks:
1. Introduction to physical metallurgy: Sidney H Avner, TATA Mc-Graw hill
2. Engineering Materials & Metallurgy: R. K. Rajput, S Chand publication.
3. Material Science & Metallurgy: V.D. Kodgire. Everest Publication House.

Reference Books:
1. Materials Science and Engineering, V. Raghavan, PHI, 2004
2. An Introduction to Materials Science and Engineering, W. D. Callister, John Wiley& Sons (2007).
3. Powder metallurgy, A.K Sinha First Edn. 1991.
4. Material Science and Metallurgy; V.D. Kodgire; Everest Publishing House
5. Engineering physical Metallurgy, Y Lakhtin, Mir Publications. Second Ed. 1999
6. Material Science and Metallurgy- C Daniel Yesudian, Scitech Publication.

NPTEL WEB VIDEOS:
1. https://nptel.ac.in/courses/112/108/112108150/
2. https://nptel.ac.in/courses/113/102/113102080/

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI

Faculty of Science and Technology

Board of Studies in Mechanical Engineering

Program:	**B. E. Mechanical Engineering**	**Semester:**	**III**
Course:	**Engineering Thermodynamics**	**Code:**	3ME200PC

Lecture	Tutorial	Hours	Credit	IE	ESE	Total
03	0	0	03	40	60	100

Methods of Internal Evaluation (IE): Class Tests, Assignments, Quiz, Class Attendance, etc.

Course Objectives:

1. To learn heat and work interactions between system and its surroundings, and energy balance
2. To apply I law of thermodynamics to various energy conversion devices
3. To evaluate the change in properties of substances during various energy conversion processes
4. To understand the difference between high grade and low grade
5. To comprehend the limitations imposed by II law of thermodynamics on energy conversion

After completion of the course, the student will be able to:

CO	Course outcome	BT level
CO-1	Apply energy balance to systems and control volumes in situations involving heat and work interactions	L2
CO-2	Evaluate changes in properties of pure substances	L3
CO-3	Evaluate and compare the performance of energy conversion devices	L2
CO-4	Differentiate between high grade and low grade energies	L2
CO-5	Analyze the impact of energy wastage and degradation on environment	L2
CO-6	Understand concept of Entropy and analyze thermodynamic cycles for efficiency and performance	L3

SYLLABUS

Unit I - Fundamentals : System and Control volume, Properties of a system, State and Equilibrium, The State Postulate, Processes and Cycles, Steady Flow Process; Temperature and Zeroth Law of Thermodynamics, Temperature Scales, Temperature Measurement Devices, Pressure and Pressure Measurement Devices, Density and Specific Gravity.

Unit II- Energy, Energy Transfer and Energy Analysis: Energy and various forms of energy, Internal Energy, Heat and energy transfer by Heat, Mechanism of Heat Transfer; Work, Electrical Work and forms of Mechanical Work; First Law of Thermodynamics and Energy Balance, Mechanisms of energy transfer to and from a system, Flow Energy, Energy conversion efficiencies, Implications of energy conversion on environment.

Unit III - Pure Substances – Phases and Phase-Change Processes of Pure Substances, Definition of saturated states, Property diagrams for Phase-Change Processes, P-v-T Surface, Property Tables, Ideal Gas & ideal gas equation of state, Ideal gas mixtures, Real gases and Real gas mixtures, Compressibility Factor, Other equations of state, Specific heats; Internal energy, enthalpy and specific heats of ideal gases, Internal Energy, enthalpy and specific heats of liquids and solids, Use of Steam Tables and R-134a Tables, Mollier's Chart.

Unit IV - First Law for Flow Processes – Conservation of Mass Principle, Mass balance for steady-flow process, Flow work and Energy of a flowing fluid, Derivation of general equation for a control volume starting from Conservation of Mass Principle, Application of conservation of mass and conservation of energy equation to steady and unsteady-flow control volumes such as nozzles, compressors, turbines, throttle valves, mixing chambers and heat exchangers.

Unit V - Second Law – Introduction and need for Second law, Thermal energy reservoirs, reversible and irreversible processes, heat engines, refrigerators and heat pumps, Kelvin-Planck and Clausius Statements of Second law of Thermodynamics, Application of Second law to cycles and cyclic devices, Thermodynamic Temperature Scale, Carnot Cycle, Carnot Principles, idealized Carnot heat engines, refrigerators and heat pumps Thermal efficiency and COP of heat engines, refrigerators and heat pumps.

Unit VI - Entropy – Clausius Inequality, Definition of Entropy to quantify the second law effects, Increase of entropy principle, Entropy change during process for a pure substance, incompressible substances and ideal gas, Isentropic Process, Reversible Steady-flow work, Isentropic efficiency for various steady-flow devices, Entropy Balance. Irreversibility and Availability, Availability functions for systems and control volumes undergoing different processes, Lost Work, Second law analysis for a control volume, Second law efficiency. Thermodynamic Cycles – Basic Gas power and Vapor power cycles and their simple analysis.

TEXTBOOKS:

1. "Thermodynamics: An Engineering Approach", Yunus Cengel and Michael Boles, 9th Edition, Mc-GrawHill Publication, 2019.
2. "Engineering Thermodynamics", P. K. Nag, 6th Edition, McGraw-Hill, 2017
3. "Thermodynamics", C.P. Arora, Tata McGraw-Hill, 1st edition, 2001.

REFERENCE BOOKS:

1. "Basic Engineering Thermodynamics", Rayner Joel, Pearson Education India, 1996
2. "Engineering Thermodynamics", P. Chattopadhyay, Oxford University Press, 2015
3. "Fundamentals of Engineering Thermodynamics", Michael J. Moran, Howard N. Shapiro, Daisie D. Boettner, Margaret B. Bailey, 9th Edition, 2018

E – RESOURCES:

NPTEL Online Courses – Swayam courses –

1. Thermodynamics, IIT Madras − https://nptel.ac.in/courses/127106135
2. Basic Thermodynamics, IISc Bangalore − https://nptel.ac.in/courses/112108148
3. Engineering Thermodynamics by IIT Madras − https://nptel.ac.in/courses/112106310
4. Elementary Thermodynamics for All, IIT Kharagpur − https://nptel.ac.in/courses/104105365

Sant Gadge Baba Amravati University, Amravati Faculty of

Science & Technology

Board of Studies in Mechanical Engineering

Program	**B. E. Mechanical Engineering**	**Semester :**	**3**
Course	**Manufacturing Technology**	**Code**	**3ME201PC**

Lecture	**Tutorial**	**Hours**	**Credit**	**TA**	**CT-I**	**CT-II**	**Th. Exam**	**Total**
3	0	3	3	40	30	30	60	100

Methods of Teacher Assessment (TA) : Class Tests, Assignments, Class Attendance, Quiz

Course objectives:

1. To study the pattern making and casting process.
2. To study the joining process.
3. To study the Mechanical working of metals.
4. To study theory of metal cutting and lathe operation.
5. To study the drilling, milling, broaching and boring process.
6. To study grinding and finishing process.

After completion of the course, the students will be able to-

CO	**Course Outcome**	**BT level**
CO-1	Apply knowledge of casting processes for the specified working conditions.	L3
CO-2	Apply the knowledge of basic and advanced welding processes to solve the related problem.	L3
CO-3	Apply the knowledge of various forming processes for the given operating conditions.	L3
CO-4	Apply the concept of mechanics of metal cutting for various lathe operations.	L3
CO-5	Understand the various milling, drilling, broaching and boring processes.	L2
CO-6	Apply the knowledge of grinding and finishing processes for enhancing the surface finish of given component.	L3

Syllabus:

Unit I:

Casting: Introduction to pattern making, types of patterns, pattern materials, pattern allowances, core print, core box, moulding sands & their properties, types of moulding, gating system. Melting furnaces, cupola, electric arc furnace, induction furnace. Casting processes & their principle of operation, permanent mould casting, die casting, centrifugal casting, investment casting. Casting defects.

Unit II:

Joining processes: Mechanical joining processes, mechanical fastening, riveting, soldering, brazing. Welding, types of welding processes – arc welding - principle and working, gas welding - principle and working, types and purpose of electrodes, electrode coatings (flux). TIG and MIG processes- working principles and applications, shielding gases. Advance welding processes such as – friction welding, ultrasonic welding, thermit welding, spot welding etc. Welding defects.

Unit III:

Mechanical working of metals: principle of hot working and cold working process and its types, Extrusion, piercing, pipe and tube production, manufacturing of seamless pipe and tubing. Shearing operation, tube drawing, wire drawing, spinning, embossing, & coining, squeezing & bending operations, rotary swaging, forging, rolling and types of rolling mills.

Unit IV:

Theory of metal cutting, mechanics of metal cutting, chip formation process, tool material, classification of tools, tool geometry, tool life, tool failure, Merchant cutting force circle. Construction and working principle and accessories of lathe machine, lathe operations like- turning, facing, thread cutting, knurling, taper turning and its methods.

Unit V:

Construction & working of drilling machine, types of drilling machine, twist drill nomenclature. Milling machines: types of milling cutters, types of milling, dividing head, compound and differential indexing. Introduction of broaching and boring processes.

Unit VI:

Grinding process: Grinding wheels, wheel marking, wheel selection, wheel mounting, types of grinding machines. Honing, lapping, super finishing, buffing & burnishing processes.

Textbooks:

1. Chapman W. A.: - "Workshop Technology, Vol. II, III and I", Edward Arnold Pub. Ltd. London.
2. Hajra Chaudhary S. K. – "Elements of workshop technology Vol. I & II," Media Prom & pub, Mumbai
3. P. N. Rao :- "Manufacturing technology Vol. II" McGraw Hill 1998

Reference books:

1. "Workshop Technology" O.P Khanna, Dhanpatrai & sons.
2. "Workshop Technology Vol. II" B. S. Raghuvanshi.

Sant Gadge Baba Amravati University, Amravati Faculty of

Science & Technology

Board of Studies in Mechanical Engineering

Program	**B. E. Mechanical Engineering**	**Semester :**	**3**
Course	**Manufacturing Technology Lab**. (PCC-II)	**Code**	3ME203PL

Manufacturing Technology Lab

Following is the list of experiments to be performed by the students.

1. Pattern making: Making of patterns (anyone)
2. Foundry: Preparation of mould for various types of patterns.
3. Preparation of one job by welding process (gas or arc welding).
4. Demonstration of milling machine for gear tooth cutting.
5. Demonstration of drilling machine for preparation of hole.
6. Preparation of one job on lathe consisting of turning operation.
7. Preparation of one job on lathe consisting of facing operation.
8. Preparation of one job on lathe consisting of taper turning operation.
9. Preparation of one job on lathe consisting of screw cutting operation.
10. Preparation of one job on lathe consisting of knurling operation.
11. Preparation of one job on lathe consisting of parting off operation.

Students should complete experiment no 1 to 5 mandatorily and any 03 experiments from exp no. 6 to 11

Sant Gadge Baba Amravati University, Amravati
Faculty of Science and Technology
Board of Studies in Mechanical Engineering

Program:	**B. E. Mechanical Engineering**	**Semester:**	**III**
Course:	**Mechanics of Materials** (PCC-III)	**Code:**	**3ME202PC**

Lecture	Tutorial	Hours	Credits	TA	CT-I	CT-II	Th. Exam	Total
3	**0**	**3**	**3**	**40**	**30**	**30**	**60**	**100**

Methods of Teacher Assessment (TA): Class Tests, Assignments. Quiz, Class Attendance, etc.

Course Objectives: To understand -

1. To develop basis for study of stress and strain in various components under different types of loading.
2. To study mechanical behaviour of materials when subjected to loads and stress either parallel or perpendicular to axis.
3. To familiarize about finding shear force, bending moment on beams, slope and deflection under different loading conditions.
4. To study torsion and it's applications to different types of helical and leaf spring.
5. To develop necessary background to apply Mechanics of material to various mechanical operations.
6. To be familiarize with study of behaviour to thermal stresses and strain.

After completion of the course, the student will be able to:

1. Basic terminology of Stress, Strain, Three Modulus of Elasticity, Poission's ratio, Factor of Safety.
2. They can then carry analysis of Compound Bars subjected to Uniaxial, Biaxial and Triaxial loads and change in temperature.
3. They will be able to calculate the Shear Force and Bending Moment and Slope and Deflection for different types of beams under different Loads.
4. They can then design shafts, cylindrical and spherical vessel and will have knowledge of Instantaneous stresses due to gradually, suddenly and Impact load.

CO	Course Outcome	BT Level
CO-1	To determine stresses and strain in a member subjected to axial, bending and torsional stresses.	L1, L2
CO-2	To observe different types of material behaviour such as elastic, plastic, ductile and brittle.	L1
CO-3	To study shear force and bending moment on different types of beams.	L3, L4
CO-4	To calculate slope and deflection on different types of beams and check the stability of beam.	L3, L4
CO-5	To study different types of loads and corresponding strain energy.	L1, L2
CO-6	To observe the effect of torsional stresses and its application to different types of spring.	L2, L3

Syllabus

Unit -I

Concept of direct, bending and shear stresses and strains, Stress-strain relations, Bi-axial and Tri axial loading, Elastic constants, Poission's ratio and their relationship, Stress-strain diagrams and their characteristics for mild steel, Factor of safety and its significance. Stresses and strains in compound bars in uni-axial tension and compression, Thermal stresses in simple restrained bars and compound bars of two metals.

Unit -II

Types of Beams and concept of Shear force and Bending moment. Axial force, shear force & bending moment diagrams for - Simply supported Beams, Overhanging Beams and Cantilever Beams subjected to Point load, uniformly distributed load. Relation between shear force, bending moment and loading intensity.

Unit -III

Theory of simple bending, section modulus, moment of resistance. Bending stresses in solid, hollow and built-up section. Leaf Spring - Semi elliptical and Quarter Elliptical type. Shear stress distribution on beams with Rectangular and Circular cross sections.

Unit -IV

Theory of torsion & assumptions, derivation of torsion equation. Polar modulus, Stresses in solid & hollow circular shaft. Power transmitted by solid and hollow shaft and their equivalence. Basic Terminology of Spring, Closed coiled helical spring with axial load. Strain energy under uni-axial tension and compression. Gradually, Suddenly and Impact loads and instantaneous stresses and strain.

Unit -V

Thin cylinders and thin spherical shells subjected to internal pressures. Biaxial stress system, principal stresses, principal planes. Mohr's circle of stresses, principal strains, principal planes.

Unit -VI

Slope and Deflection for Simply supported and Cantilever Beams - subjected to Point loads and uniformly distributed load by Macaulay's method. End Conditions.

TEXTBOOKS:

1. A Textbook of Strength Of Materials: By R. K. Bansal
2. Strength of Material: S.I. Units: By S. Ramamrutham
3. Strength of Materials: By R K Rajput
4. Strength of Materials: By Bhavikatti

REFERENCE BOOKS:

1. **Strength of Materials Vol. I**: By S. P. Timoshenko
2. **Strength of Materials Vol. II**: By S. P. Timoshenko
3. **Strength of Materials**: By Dr. B.C. Punmia
4. **Advanced Mechanics of Solids**: By Srinath L. N.
5. **Solid Mechanics**: By Kazimi S. M. A.

MOOC LINKS:

1. Strength of Materials - IITM - Course

Sant Gadge Baba Amravati University, Amravati
Faculty of Science and Technology
Board of Studies in Mechanical Engineering

Program:	**B. E. Mechanical Engineering**	**Semester:**	**III**
Course:	**Mechanics of Materials Lab.** (PCC-III)	**Code:**	**3ME204PL**

Practical:

Minimum Six to Eight out of the followings:

1. Tension test on metals.
2. Compression test on materials
3. Shear test on metals
4. Impact test on metals
5. Hardness test on metals
6. Torsion test on metals
7. Deflection of beams
8. Modulus of rupture test.
9. Deflection of springs.

Practical examination shall be viva-voce based on above practical and the syllabus of the course.

Sant Gadge Baba Amravati University, Amravati
Faculty of Science and Technology
Board of Studies in Mechanical Engineering

Program:	**B. E. Mechanical Engineering**	**Semester:**	**III**
Course:	**Basics of Mechanical Engineering (MDM-I)**	**Code:**	**3ME205M**

Lecture	**Tutorial**	**Hours**	**Credit**	**IE**	**ESE**	**Total**
02	-	02	02	20	30	50

Methods of Internal Evaluation (IE): Class Tests, Assignments, Quiz, Class Attendance, etc.

Course Objectives:

This course introduces various streams of mechanical engineering such as thermal, design, and manufacturing. It includes the engineering materials, mechanical measurements, energy conversion systems, and various manufacturing techniques required to make the mechanical system to function efficiently. The course objectives are:

1. To introduce and define the engineering materials and concepts of mechanical engineering.
2. To enable the students to understand the details about the energy systems and its components.
3. To help the students acquire knowledge about the various manufacturing process and to demonstrate the various machine elements.

After completion of the course, the student will be able to:

CO	**Course Outcome**	**BT Level**
CO-1	Understand the properties, testing and inspection of engineering materials.	L2
CO-2	Summarize fundamental techniques and process used in energy conversion systems.	L2
CO-3	Understand various casting techniques and the importance of various metal forming processes.	L2

SYLLABUS:

Unit I: Engineering Materials and Measurement

Role of Mechanical Engineering in Industries and Society- Emerging Trends and Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.

Engineering Materials - Classification of engineering material, composition of cast iron and carbon steels on iron-carbon diagram and their mechanical properties; Alloy steel and their applications; Stress-Strain diagram, Hooks law and modulus of elasticity.

Mechanical Measurement: Temperature, pressure, velocity, flow, strain, force and torque measurement, measurement by Vernier calliper, micrometre, dial gauges, slip gauges, sine-bar and combination set.

Unit II: Energy Conversion systems

Heat Engines: Thermal prime movers, Elementary heat engines, sources of heat, working substances, Converting machines, Classification of heat engines, heat engine cycles, Carnot cycle, Rankine cycle, Otto cycle, Diesel cycle. Power Producing Devices: Internal Combustion Engines: Introduction, Classification, Otto and Diesel four stroke cycle, Comparison of otto and diesel cycle, Indicated Power, Brake Power, Efficiencies (Elementary Treatment), Vapour compression Refrigeration Cycle, Introduction and Working Principles of prime movers: Steam turbines, Gas turbines, Hydraulic turbines (Elementary Treatment)

Unit III: Manufacturing Processes

Basic description of the manufacturing processes – Sand Casting, Forging, Rolling, Extrusion and their applications. Basic Machining operations: Turning, Drilling, Milling and Grinding.

Power Transmission Methods and Devices: Transmission -Gears – basic concepts, Chain, Pulleys and Belts. Bearings, Fasteners, Flywheels, clutches, brakes and dynamometers. Introduction to machine elements.

TEXTBOOKS

1. Basant Agarwal and C.M. Agarwal, Basic Mechanical Engineering, Wiley India Pvt. Ltd., 2008.
2. Sadhu Singh, Elements of Mechanical Engineering, S. Chand Publication, 2010.

REFERENCE BOOKS

1. G. S. Sawhney, Fundamentals of Mechanical Engineering, Prentice Hall of India Publication New Delhi, 2015.
2. R. K. Rajput, Thermal Engineering, S. Chand Publication New Delhi.2020.
3. B. K. Agrawal, Introduction to Engineering Materials, Tata McGraw hill Publication, New Delhi, 2017.

Sant Gadge Baba Amravati University, Amravati
Faculty of Science and Technology
Board of Studies in Mechanical Engineering

Program:	B. E. Mechanical Engineering	**Semester:**	**III**
Course:	**Power Plant Engineering** (Open Elective-I)	**Code:**	3ME206OE

Lecture	Tutorial	Hours	Credit	IE	ESE	Total
03	0	0	03	40	60	100

Methods of Internal Evaluation (IE): Class Tests, Assignments, Quiz, Class Attendance, etc.

Course Objectives:

1. To impart basic knowledge – components, working and performance of various types of power plants and the associated energy conversion issues.
2. To provide insights of operation and economics of power generation.

After completion of the course, the student will be able to:

CO	Course Outcome	BT Level
CO-1	Discuss the energy sources and principles of operation for different power plants.	L2
CO-2	Determine the performance of the thermal power plant and its systems	L3
CO-3	Describe working principles of a gas turbine power plant and its components.	L2
CO-4	Describe the design layout and working of hydroelectric power plants.	L2
CO-5	Compare various types of nuclear reactors and recognize nuclear waste disposal issues.	L2
CO-6	Calculate power plant factors and identify parameters affecting economics of power plant.	L3

Syllabus:

UNIT I: Introduction to power plants

Energy Sources, Recent trends in power generation, Classification of power plants, Review of thermodynamic cycles related to power plants, Rankine Cycle, fuels and combustion calculations, General Layout of a modern power plant, site selection criteria, current scenario of power generation in India.

UNIT II: Coal Based Thermal Power Plants

Basic Rankine cycle and its modifications, layout of modern coal power plant, super critical boilers, FBC boilers, turbines, condensers and cooling towers, steam and heating rates, subsystems of thermal power plants, fuel and ash handling systems, draught system, feed water treatment.

UNIT – III: Gas Turbine and Combined Cycle Power Plants

Brayton cycle analysis and optimization, components of gas turbine power plants, Gas turbine fuels, cogeneration, auxiliary systems such as fuel, controls and lubrication, operation and maintenance, combined cycle power plants.

UNIT – IV: Hydroelectric Power Plants

Hydroelectric station Hydrology, Principles of working, typical layout and components, site selection, classification and arrangements, hydro-electric plants, run off size of plant and choice of units, operation and maintenance.

UNIT – V: Nuclear Power Plants

Nuclear fusion and fission, comparison of fusion-fission, nuclear fuels, chain reaction, components of nuclear reactors, Classification of reactors pressurized water reactor, boiling water reactor, gas cooled reactor, CANDU reactor, liquid metal cooled reactor, fast breeder reactor, nuclear waste and its disposal, Site selection for nuclear reactor, current scenario of nuclear power generation in India.

UNIT – VI: Economics of Power Generation

Load estimation, Load curves, Load duration curves, Connected load, Maximum load, Peak load, base load and peak load power plants, Load factor, Plant capacity factor, Plant use factor, Demand factor, Diversity factor, effect of fluctuating load, Power plant economics, Performance and operating characteristics of power plant, Tariff for electric energy and cost of electric energy.

TEXTBOOKS:

1. Nag P. K., Power Plant Engineering, 3rd ed., Tata McGraw Hill, 2008.
2. El Wakil M. M., Power Plant Technology, Tata McGraw Hill, 2010.
3. V. Ganesan, Gas Turbines, Tata McGraw Hill Book Company, 2017, 3rd Edition,
4. Domkundwar S., Power Plant Engineering, Dhanpatrai & sons.
5. Rajput R. K., Power Plant Engineering, Laxmi Publications, Fifth Edition.
6. P. C. Sharma, Power plant engineering, S. K. Kataria & Sons, New Delhi, 2010

REFERENCE BOOKS:

1. Elliot T.C., Chen K and Swanekamp R.C., Power Plant Engineering, 2nd ed., McGraw Hill, 1998.
2. Black and Veatch, Power Plant Engineering, CBS Publisher and Distributors, 2005.

e-RESOURCES

1. https://archive.nptel.ac.in/courses/112/107/112107291/
2. https://www.plantengineering.com/

Sant Gadge Baba Amravati University, Amravati

Faculty of Science & Technology

Board of Studies in Mechanical Engineering

Program	**B. E. Mechanical Engineering**	**Semester :**	**3**
Course	**Manufacturing Processes**	**Code**	3ME206OE

Lecture	**Tutorial**	**Hours**	**Credit**	**TA**	**CT-I**	**CT-II**	**Th. Exam**	**Total**
3	0	3	3	40	30	30	60	100

Methods of Teacher Assessment (TA) : Class Tests, Assignments, Class Attendance, Quiz

Course objectives:

I. To study the various manufacturing processes.

II. To study the casting process.

III. To study the Mechanical working of metals.

IV. To study joining processes.

V. To study the theory of metal cutting and lathe operation.

VI. To study additive manufacturing process.

After completion of the course, the students will be able to-

CO	**Course outcome**	**BT level**
CO-1	Explain different types of manufacturing processes and their applications.	L2
CO-2	Describe the metal casting process and equipment used.	L2
CO-3	Apply the knowledge of various forming processes for the given operating conditions.	L3
CO-4	Explain the principles and operations of welding processes.	L2
CO-5	Identify the tool geometry of a single point cutting tool and principles of metal cutting.	L3
CO-6	Differentiate between additive and subtractive manufacturing processes.	L2

Syllabus:

Unit I:

Understanding Manufacturing: concept of manufacturing, need, scope, advantages, limitation, application, materials and manufacturing, classification of manufacturing. Heat treatment processes.

Unit II:

Casting: Working principle, steps, pattern, molding, gate and riser, melt treatment, solidification, casting processes: sand mould, shell mould, permanent mould casting, casting defect and their remedy.

Unit III:

Forming: Working principle, hot and cold forming, rolling, forging, extrusion, drawing, sheet metal forming, press, dies, types of dies and die set sheet metal operations punching, blanking, notching, nibbling.

Unit IV:

Joining: Working principle, need, principle of fusion welding, gas welding, thermit welding, arc welding common arc welding processes, resistance welding, weldability of metals, solidification of weld, weld discontinuities and their remedy.

Unit V:

Machining: Working principle, mechanism, classification, cutting tool, tool material, heat generation, cutting fluid, grinding, internal and external surface grinding, centerless grinding designation and selection of grinding wheel, trueing and balancing, honing, reaming, lapping, polishing etc.

Unit VI:

Additive Manufacturing: Introduction to Additive Manufacturing, Rapid Prototyping Technology (SLS), 3D Printing Technology (FDM, etc.)

TEXTBOOKS:

1. S. Kalpakjian and S. R. Schmid, Manufacturing engineering and technology, 7th edition of Pearson publication.
2. P. N. Rao Manufacturing technology volume-II, 3rd edition of TMH publication.
3. P. N. Rao Manufacturing technology volume-I, 3rd edition of TMH publication.

REFERENCE BOOKS:

1. “Workshop Technology” O.P Khanna, Dhanpatrai & sons.
2. “Workshop Technology Vol. I and II” B. S. Raghuvanshi.

ONLINE RESOURCES:

1. Fundamentals of Manufacturing processes by Prof. D K Dwivedi IIT Roorkee NPTEL course (https://onlinecourses.nptel.ac.in/noc20_me67/preview)