

Branch: MECHANICAL	Year: IV	Semester: Even
Subject Code: NME-801	Subject Name: Power Plant Engineering	
Course Outcomes:	1. Explain the economics involved in Power Plant and identify the factors related to selection of plant.	
	2. Discuss various components of steam power plant and the factors influencing the site selection for the plant.	
	3. Describe the working of various components of diesel power plant and compare it with steam power plant.	
	4. Illustrate the working of gas turbine power plant and its components.	
	5. Explain the components, principles and working of nuclear & non-conventional power plant.	
	6. Describe the electrical, instrumentation & pollution control systems used in power plants.	
Syllabus: As per AKTU		
Unit 1	<p>Introduction Power and energy, sources of energy, review of thermodynamic cycles related to power plants, fuels and combustion calculations. Load estimation, load curves, various terms and factors involved in power plant calculations. Effect of variable load on power plant operation, Selection of power plant units. Power plant economics and selection, Effect of plant type on costs, rates, fixed elements, energy elements, customer elements and investor's profit; depreciation and replacement, theory of rates. Economics of plant selection, other considerations in plant selection.</p>	
Unit 2	<p>Steam power plant General layout of steam power plant, Power plant boilers including critical and super critical boilers. Fluidized bed boilers, boilers mountings and accessories, Different systems such as coal handling system, pulverizers and coal burners, combustion system, draft, ash handling system, Dust collection system, Feed water treatment and condenser and cooling towers and cooling ponds, Turbine auxiliary systems such as governing, feed heating, reheating , flange heating and gland leakage. Operation and maintenance of steam power plant, heat balance and efficiency, Site selection of a steam power plant.</p>	
Unit 3	<p>Diesel power plant General layout, Components of Diesel power plant, Performance of diesel power plant, fuel system, lubrication system, air intake and admission system, supercharging system, exhaust system, diesel plant operation and efficiency, heat balance, Site selection of diesel power plant, Comparative study of diesel power plant with steam power plant.</p> <p>Gas turbine power plant Layout of gas turbine power plant, Elements of gas turbine power plants, Gas</p>	

	turbine fuels, cogeneration, auxiliary systems such as fuel, controls and lubrication, operation and maintenance, Combined cycle power plants, Site selection of gas turbine power plant.
Unit 4	<p>Nuclear power plant Principles of nuclear energy, Lay out of nuclear power plant, Basic components of nuclear reactions, nuclear power station, Nuclear waste disposal, Site selection of nuclear power plants.</p> <p>Hydro electric station Hydrology, Principles of working, applications, site selection, classification and arrangements, hydro-electric plants, run off size of plant and choice of units, operation and maintenance, hydro systems, interconnected systems.</p> <p>Non Conventional Power Plants Introduction to non-conventional power plants (Solar, wind, geothermal, tidal) etc.</p>
Unit 5	<p>Electrical system Generators and generator cooling, transformers and their cooling, bus bar, etc.</p> <p>Instrumentation Purpose, classification, selection and application, recorders and their use, listing of various control rooms.</p> <p>Pollution Pollution due to power generation.</p>

Branch: MECHANICAL	Year: IV	Semester: Even
Subject Code: NOE-083	Subject Name: Product Development	
Course Outcomes:	1. Understand the concept of product development, physical reliability & economic feasibility of design	
	2. Carry out need analysis and have clear understanding of various design aspects.	
	3. Understand and use the morphological analysis of design and knowledge of different ideation technique for creative and innovative designs.	
	4. Understand basic concepts of reliability and be in a position to use them in product design and development	
	5. Understand and appreciate the significance of ergonomic, economic considerations in product design	
	6. Make use of techniques such as work-study, SQC etc. for improving the methods & quality of product being designed.	
Syllabus: As per AKTU		
Unit 1	Concept of Product, definition and scope. Design definitions, old and new design methods, design by evolution, examples such as evolution of sewing M/C, bicycle, safety razor etc., need based developments, technology based developments physical reliability & economic feasibility of design concepts.	
Unit 2	Murphology of design, divergent, transformation and convergent phases of	

	product design, identification of need, Analysis of need. Design criteria; functional, aesthetics, ergonomics, form, shape, size, colour. Mental blocks, Removal blocs, Ideation techniques, Creativity, Check list.
Unit 3	Transformations, Brainstorming& Synetics, Morphological techniques. Utility Concept, Utility Value, Utility Index, Decision making under Multiple Criteria. Economic aspects, Fixed and variable costs, Break-even analysis
Unit 4	Reliability considerations, Bath tub curve, Reliability of systems in series and parallel, Failure rate, MTTF and MTBF, Optimum spares from Reliability considerations. Design of display and controls, Man-machine interface, Compatibility of displays and controls. Ergonomic aspects, Anthropometric data and its importance in design. Application of Computers in Product development & design.
Unit 5	Existing techniques, such as work-study, SQC etc. for improving method & quality of product. Innovation versus Invention. Technological Forecasting. Use of Standards for Design.

Branch: MECHANICAL	Year: IV	Semester: Even
Subject Code: NME-065	Subject Name: Non Destructive Testing	
Course Outcomes:	1. Understand the Scope and advantage of Non Destructive testing	
	2. Differentiate various defect types and select the appropriate NDT methods for better evaluation.	
	3. Apply various NDT techniques such as Die penetrate test and magnetic inspection for various products.	
	4. Understand the principle of Radiographic Method used in material testing	
	5. Understand the principle of Ultrasonic testing method and its applications	
	6. Understand the Special NDT Techniques such as Eddy Current Inspection, Acoustic emission testing	
Syllabus: As per AKTU		
Unit 1	Introduction Scope and advantages of NDT, Comparison of NDT with Destructive Testing, Some common NDT methods used since ages, Terminology, Flaws and Defects, Visual inspection, Equipment used for visual inspection. Ringing test, chalk test (oil whitening test). Uses of visual inspection tests in detecting surface defects and their interpretation, advantages & limitations of visual inspection.	
Unit 2	Die penetrate test (liquid penetrate inspection), Principle, scope. Equipment & techniques, Tests stations, Advantages, types of penetrants and developers, Zygo test, Illustrative examples and interpretation of defects. Magnetic particle Inspection – scope and working principle, Ferro Magnetic and Nonferromagnetic	

	materials, equipment & testing. Advantages, limitations Interpretation of results, DC & AC magnetization, Skin Effect, use of dye & wet powders for magna glow testing, different methods to generate magnetic fields, Applications.
Unit 3	Radiographic methods Introduction to electromagnetic waves and radioactivity, various decays, Attenuation of electromagnetic radiations, Photo electric effect, Rayleigh's scattering (coherent scattering), Compton's scattering (Incoherent scattering), Pair production, Beam geometry and Scattering factor. X-ray radiography: principle, equipment & methodology, applications, types of radiations and limitations. γ -ray radiography – principle, equipment., source of radioactive materials & technique, advantages of γ -ray radiography over X-ray radiography Precautions against radiation hazards. Case Study - casting and forging.
Unit 4	Ultrasonic testing methods Introduction, Principle of operation, Piezoelectricity. Ultrasonic probes, CRO techniques, advantages, Limitation & typical applications. Applications in inspection of castings, forgings, Extruded steel parts, bars, pipes, rails and dimensions measurements. Case Study – Ultrasonography of human body.
Unit 5	Special NDT Techniques Eddy Current Inspection: Principle, Methods, Equipment for ECT, Techniques, Sensitivity, advanced ECT methods. Application, scope and limitations, types of Probes and Case Studies. Introduction to Holography, Thermography and Acoustic emission Testing.

Branch: MECHANICAL	Year: IV	Semester: Even
Subject Code: NME-055	Subject Name: Advance Welding Technology	
Course Outcomes:	1. Understand the theoretical and practical aspects of welding and it's phenomena.	
	2. Understand the various welding process.	
	3. Describe the basic metallurgy of the melted and heat-affected zone of a metal or alloy and heat transfer involved in different welding process	
	4. Understand the various process involved in repair and maintenance of welding i.e. hard facing, cladding	
	5. Understand the weldability of different metal.	
	6. Demonstrate their ability to check the weldment quality using various inspection and testing methods.	
Syllabus: As per AKTU		
Unit 1	Introduction: Welding as compared with other fabrication processes, Importance and application of welding, classification of welding processes, Health & safety measures in welding. Welding Power Sources: Physics of welding Arc, Basic characteristics of power sources for various arc welding processes, Transformer, rectifier and generators.	

	<p>Physics of Welding Arc: Welding arc, arc initiation, voltage distribution along the arc, arc characteristics, arc efficiency, heat generation at cathode and anode, Effect of shielding gas on arc, isotherms of arcs and arc blow.</p> <p>Metal Transfer: Mechanism and types of metal transfer in various arc welding processes.</p>
Unit 2	<p>Welding Processes: Manual Metal Arc Welding (MMAW), TIG, MIG, Plasma Arc, Submerged Arc Welding, Electrode Gas and Electroslag, Flux Cored Arc Welding, Resistance welding, Friction welding, Brazing, Soldering and Braze welding processes, Laser beam welding, Electron beam welding, Ultrasonic welding, Explosive welding, Friction Stir Welding, Underwater welding & Microwave welding.</p>
Unit 3	<p>Heat Flow Welding: Calculation of peak temperature; Width of Heat Affected Zone (HAZ); cooling rate and solidification rates; weld thermal cycles; residual stresses and their measurement; weld distortion and its prevention.</p>
Unit 4	<p>Repair & Maintenance Welding: Hardfacing, Cladding, Surfacing, Metallizing processes and Reclamation welding.</p> <p>Weldability: Effects of alloying elements on weld ability, welding of plain carbon steel, Cast Iron and aluminium. Micro & Macro structures in welding.</p>
Unit 5	<p>Weld Design : Types of welds & joints, Joint Design, Welding Symbols, weld defects, Inspection/testing of welds, Introduction to Welding Procedure Specification & Procedure Qualification Record.</p>