



SARVAPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL (M.P.)

METE – 201 Thermal Power Plant Engg.

UNIT 1

Conventional thermal power plants, super-critical power plants and its principles of working, performance curves and flow diagrams.

UNIT 2

Power plant components: Fuel and ash handling, pulverized fuel firing burners, dust handling, fluidized bed combustion. Radiant super heaters and re-heaters, economizer and pre-heaters, combustion and furnace design, boiler water supply and treatment. Draft and arrangement of draft fans, different types of cooling systems, open closed, mixed and dry cooling tower systems, air cooled condensers. Ejector and vacuum pumps, feed heating systems, heaters, evaporators and de-aerator, feed line protection, boiler feed pumps, different type of drives for it, steam turbine driven feed pumps.

Unit 3

Plant instrumentation for thermal power plants, need and importance, distributed and centralized, pneumatic and electro-mechanical transducers and controllers, distributed computer control. Piping and insulation: design and layout of ducting for air fuel, gases and pulverized fuels, selection of piping, pipe flexibility analysis, Various control valves and actuators. Insulation optimum thickness and costs.

Unit 4

Installation, commissioning and operation: Preliminary performance checks and acceptance test for various components, heat balance of items and entire plant. Starting loading and normal operation checks, maintenance logging, parallel operations, droop setting, performance analysis, maintenance, safety and pollution controls.

UNIT 5

Plant Management: Preparing specifications and contract documents, guarantee. Training of power plant personnel, safety, and seismic analysis. Purchase and contract for fuel supplies. Reference Books:

1. Power Plant Engineering, F T Morse
2. Power Plant Engineering, P K Nag
3. Power Plant Engineering, Arora and Domkundwar



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METE – 202 Design of heat Exchangers

UNIT 1

Types of Heat Exchangers, definitions & quantitative relationship

UNIT 2

Analytical & Numerical solution Procedures, Fouling factors, Correction factors

UNIT 3

Thermal & hydraulic design of Commonly used heat exchangers : Double pipe heat exchangers , shell and tube heat exchangers, condensers, Evaporators, Cooling and dehumidifying coils, Cooling towers, Evaporative condensers , design of air washers , desert coolers .

UNIT 4

Review of mechanical Design, TEMA Codes Materials of Construction , corrosion damage , Testing and inspection .

UNIT 5

Heat Pipe: Basics & its mathematical model , micro Heat Exchangers. Use of software in heat exchanger design.

Reference Books:

1. Compact Heat Exchangers Kays and London, TMH
2. Heat Exchangers- Thermal Hydraulic fundamentals and design, Kokac, TMH
3. Extended Surface Heat Transfer, D Q Kern, A D Kraus, TMH.
4. Tubular Exchanger Manufacturer Association (TEMA), and other codes.



SARVAPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL (M.P.)

METE – 203 Advance Refrigeration System

UNIT 1

Introduction: Thermodynamics Properties of pure and Mixed Refrigerants and their selection. Vapor Compression System, Actual Vapor Compression System, Deviation from theoretical System, Multi-pressure System with Flash Chamber and Inter Cooling, Cascade system.

UNIT 2

Refrigeration Equipments: Compressors, Analysis and Thermal Design of Reciprocating, Centrifugal and Screw Compressors, Performance Characteristics & Capacity control. Expansion Devices: Capillary, Automatic and Thermostatic Expansion Valve. Other Equipments: Liquid Receiver, Oil Separators, Liquid Line Strainers, Driers, Liquid Sub-coolers.

UNIT 3

Condenser & Evaporator: Types, performance & Their Controls.

UNIT 4

Thermodynamics of Refrigerant: Absorbent Combinations, Analysis of simple and Industrial Vapor Absorption system using various working fluids Solar Powered Refrigeration & Heat Pump.

Books:

1. Refrigeration & Air Conditioning by W.F.Stoecker
2. Refrigeration & Air Conditioning by C.P.Arora
3. Refrigeration & Air Conditioning by Manohar Prasad



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METE – 204 Steam and Gas Turbines

Unit 1 :-Steam Turbines:Principle and working of steam turbines, type of turbines, impulse and reactions, compounding for pressure and velocity. Velocity triangles for various types, stage to blade, speed ratio for optimum efficiency, diagram efficiency, steams performance. Energy losses in steam turbine, turbine performance at various loads and governing of steam turbines. Constructional details and description of steam turbine components in brief.

Unit 2

Regenerative feed heating cycles: Introduction : Most Ideal Regenerative feed heating cycle. Regenerative feed heating cycles and their representation on T-s and h-s Diagram. Representation of actual process on T-s and h-s Diagram Regenerative cycles. Other types of feed heating arrangements. Optimum feed water temperature and saving in Heat Rate. Feed Heaters, Direct Contact Heaters, Surface Heaters, Deaerators .

Unit 3

Reheating – Regenerative and Regenerative water – Extraction Cycles. Reheating of steam, Practical reheating and Non- reheating cycles, advantage & disadvantages of reheating, regenerative water extraction cycles, practical feed heating arrangements. Feed heating system for 120MW, 200MW, 350MW, 500MW & 660 MW Units.

Unit 4

Mixed Pressure Turbines: Low- pressure Turbines, Mixed pressure Turbines, Heat Accumulators.

Unit 5

Gas Turbines:Open and closed cycles, constant pressure and constant volume cycles, cycles with inter cooling, reheating and heat exchanger, compressor and turbine efficiencies, pressure losses, performance characteristics of various cycles, practical problems.
Jet Propulsion: Calculation of thrust, Power, speed and efficiency, turbo – jet and turbo propulsion systems.

Reference books:

1. Fluid dynamics and heat transfer of turbo-machinery, Budugur Lakshminarayana, Amazon.com
2. Cohen H Rogers, Sarvanmutto, Gas Turbine Theory, Longman Pub.
3. Mathur, Sharma, Gas turbine, Standard Pub And Distributors Delhi.



SARVAPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL (M.P.)

METE – 205 Maintenance of Thermal Power Plant

Unit 1

Maintenance Management: emergency maintenance procedure Maintenance strategies, maintenance such spare part management, inventory control purchase procedure and storage, Warning systems, organization of maintenance department, human consideration.

Unit 2

Diagnostic Maintenance and Machine Health Monitoring: Introduction to maintenance techniques, preventive and predictive maintenance, signature analysis, observational and estimation techniques, online techniques specially dealing with instrumentation system, off-line techniques, non-destructive testing, practical application of diagnostic maintenance to specific industrial machinery and plants. Various techniques of condition monitoring wear analysis, vibration and noise signature, thermography etc.

Unit 3

Mechanism of Lubrication & Lubricants: Lubrication regimes, analysis and modes of lubrication in different bearings, squeeze films, fluid film, elasto-hydrodynamic and boundary lubrications theories and applications, environmental effects on lubrications, types of lubricant and properties, non-conventional lubricants and applications.

Unit 4

Failure Mechanisms and Analysis: Material failure due to environmental effects, Introduction; Importance of failure analysis, common causes of failure in metals & alloys. Failure due to faulty heat treatment, embrittlement of metals, Residual stresses in metals, and their effects. Defects in production and manufacture. Design faults, analysis of engineering failures, failure due to abuse of machinery, failure of seals & packing, failure of bearings, failure of gears, fatigue failure, failure due to time-temperature effects(creep) corrosion etc.

Unit 5

Maintenance of Power Plant Machinery: Predictive and preventive maintenance of steam turbine and its components, Erosion of blades and its prevention. Lubrication of bearings, valves, Maintenance scheduling, methods of detection of leaking and its prevention in the condensers. Condenser fault systems and its cases. On load and off load cleaning of condenser tubes, Maintenance scheduling of cooling water plants, cooling towers, Life enhancement techniques, case studies.

Reference Books:

1. Maintenance & Spare Parts & Management
2. Maintenance Engg. Handbook
3. Industrial Maintenance Management
4. Reliability Centered Maintenance
5. Maintenance Engg. & Management
6. Modern Power plant Practice
7. Power Generation Handbook

- P. Gopal Krishnan & Bannerjee -
by Lindley & Higgins
- by Neibel
- by Moubray
- By R.C. Mishra
- 10 Volumes British Electricity Int. Ltd.
- Philip Kaimeh.Mc Graw HCourse