PEOPLE'S UNIVERSITY, BHOPAL

(Applicable for Admitted from Academic Session 2019-20 onwards)

Programme: Master of Technology Specialization: Thermal Engineering Semester –III

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External	Internal	Total (100)	External	Internal	Total
MT13101	Industrial Safety	3	1	-	(70)	(30)	Min: 40 (D Grade)	Nil	Nil	Nil

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 15	Assignment/Quiz/Attendance- Max. Marks: 15
Practical Internal Max Marks: Nil	Lab work & Sessional – Max Marks: Nil	Assignment / Quiz/Attendance- Max. Marks: Nil

Pre-Requisite	Functioning of Engineering equipments and industry work culture.
Course Outcome	1. Student should able to apply standard safety procedures in an industrial environment.
	2. An ability to identify, formulate, and solve broadly-defined technical or scientific problems by applying knowledge of mathematics and science and/or technical topics to areas relevant to the safety.

Unit	Contents (Theory)	Marks Weightage
I	**Industrial Safety:** Accident; causes; types; results and control; mechanical and electrical hazards; types; causes and preventive steps/procedure; describe salient points of factories act 1948 for health and safety; wash rooms; drinking water layouts; light; cleanliness; fire; guarding; pressure vessels; etc; Safety color codes. Fire prevention and firefighting; equipment and methods.	**14**
II	**Fundamentals of Maintenance Engineering:** Definition and aim of maintenance engineering; Primary and secondary functions and responsibility of maintenance department; Types of maintenance; Types and applications of tools used for maintenance; Maintenance cost & its relation with replacement economy; Service life of equipment.	**14**
III	**Wear and Corrosion and their Prevention:** Wear- types; causes; effects; wear reduction methods; lubricants-types and applications; Lubrication methods; general sketch; working and applications of Screw down grease cup; Pressure grease gun; Splash lubrication; Gravity lubrication; Wick feed lubrication; Side feed lubrication; Ring lubrication; Definition; principle and factors affecting the corrosion; Types of corrosion; corrosion prevention methods.	**14**
IV	**Fault Tracing:** Fault tracing-concept and importance; decision tree concept; need and applications; sequence of fault finding activities; show as decision tree; draw decision tree for problems in machine tools; hydraulic; pneumatic; automotive; thermal and electrical equipment's like;. Any one machine tool; Pump ;Air compressor; Internal combustion engine; Boiler; Electrical motors; Types of faults in machine tools and their general causes.	**14**
V	**Periodic and Preventive Maintenance**: Periodic inspection-concept and need; degreasing; cleaning and repairing schemes; overhauling of mechanical components; overhauling of electrical motor; common troubles and remedies of electric motor; repair complexities and its use; definition; need; steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: Machine tools; Pumps; Air compressors; schedule of preventive maintenance of mechanical and electrical equipment; advantages of preventive maintenance. Repair cycle; concept and importance.	**14**

Text Book/References Books/ Websites:

1. Maintenance Engineering Handbook; Higgins & Morrow; Da Information Services.
2. Maintenance Engineering; H. P. Garg; S. Chand and Company.
3. Pump-hydraulic Compressors; Audels; Mcgrew Hill Publication.
4. Foundation Engineering Handbook; Winterkorn; Hans; Chapman & Hall London

Suggested List of Laboratory Experiments :- (Expandable): Nil

PEOPLE'S UNIVERSITY, BHOPAL

(Applicable for Admitted from Academic Session 2019-20 onwards)

Programme: Master of Technology Specialization: Thermal Engineering Semester –III

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External (70)	Internal (30)	Total (100)	External	Internal	Total
MT13102	Waste to Energy	3	1	-			Min: 40 (D Grade)	Nil	Nil	Nil

Duration of Theory (Externals): 3 Hours

Theory Internal-Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 15	Assignment/Quiz/Attendance- Max. Marks: 15
Practical Internal Max Marks: Nil	Lab work & Sessional – Max Marks: Nil	Assignment / Quiz/Attendance- Max. Marks: Nil

Pre-Requisite	Nil
Course Outcome	1. Student should able to apply the knowledge about the operations of Waste to Energy Plants.
	2. Apply the knowledge in planning and operations of Waste to Energy plants.
	3. Able to analyze the various aspects of Waste to Energy Management Systems.

Unit	Contents (Theory)	Marks Weightage
I	**Introduction to Energy from Waste:** Classification of waste – agro based, forest residues, domestic waste, industrial waste (hazardous and non-hazardous). Characterization of waste for energy utilization; Conversion devices – Incinerators, gasifiers, digestors ;Waste production in different sectors i.e. domestic, industrial, agriculture, postconsumer waste etc. Waste Selection criteria.	**14**
II	**Technologies for Waste to Energy Biochemical Conversion** – Energy production from organic waste through anaerobic digestion and fermentation. Thermo-chemical Conversion – Combustion, Incineration and heat recovery, Pyrolysis, Gasification; Plasma Arc Technology.	**14**
III	**Waste to Energy Options**: Landfill gas, collection and recovery. Refuse Derived Fuel (RDF) – fluff, briquettes, pellets. Alternate Fuel Resource (AFR) – production and use in Cement plants, Thermal power plants and Industrial boilers. Conversion of wastes to fuel resources for other useful energy applications. Energy from Plastic Wastes – Non-recyclable plastic wastes for energy recovery. Energy Recovery from wastes and optimization of its use, benchmarking and standardization.	**14**
IV	**Centralized and Decentralized Waste to Energy Plants**: collection, segregation, transportation and storage requirements. Location and Siting of 'Waste to Energy' plants. Industry Specific Applications – In-house use – sugar, distillery, pharmaceuticals, Pulp and paper, refinery and petrochemical industry and any other industry. Centralized and Decentralized Energy production, distribution and use. Comparison of Centralized and decentralized systems and its operations.	**14**
V	**Waste To Energy & Environmental Implications**: Environmental standards for Waste to Energy Plant operations and gas clean-up;Savings on non-renewable fuel resources;Carbon Credits: Carbon foot calculations and carbon credits transfer mechanisms;Energy Analysis; Global Best Practices in Waste to energy production and use. Indian Scenario on Waste to Energy production distribution and use in India. Role of the Government in promoting 'Waste to Energy'.	**14**

Text Book/References Books/ Websites:

1. Industrial and Urban Waste Management in India; TERI Press.
2. Banwari Lal and Patwardhan; Wealth from Waste: Trends and Technologies; TERI Press.
3. S.N Mukhopadhyay; Fundamentals of waste and Environmental Engineering; TERI Press.
4. www.envfor.nic.in www.cpcb.nic.in
5. www.teriin.org/projects/green/pdf/National-Waste.pdf

Suggested List of Laboratory Experiments (Expandable): Nil

PEOPLE'S UNIVERSITY, BHOPAL

(Applicable for Admitted from Academic Session 2019-20 onwards)

Programme: Master of Technology Specialization: Thermal Engineering Semester –III

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External (70)	Internal (30)	Total (100)	External	Internal	Total
MT13103	Cost Management of Engineering Projects	3	1	-			Min: 40 (D Grade)	Nil	Nil	Nil

Duration of Theory (Externals): 3 Hours

Theory Internal-Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 15	Assignment/Quiz/Attendance- Max. Marks: 15
Practical Internal Max Marks: Nil	Lab work & Sessional – Max Marks: Nil	Assignment / Quiz/Attendance- Max. Marks: Nil

Pre-Requisite	Nil
Course Outcome	1. Students should able to perform and evaluate present worth, future worth and annual worth analyses on one of more economic alternatives.
	2. Able to carry out and evaluate benefit/cost, life cycle and Breakeven analyses on one or more economic alternatives.

Unit	Contents (Theory)	Marks Weightage
I	Introduction and Overview of the Strategic Cost Management Process Cost concepts in decision-making; Relevant cost; Differential cost; Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.	**14**
II	Project: meaning; Different types; why to manage; cost overruns centers; various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and nontechnical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram	**14**
III	Project commissioning: mechanical and process Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis; Cost-Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis.	**14**
IV	Pricing strategies: Pareto Analysis. Target costing; Life Cycle Costing. Costing of service sector. Just-in-time approach; Material Requirement Planning; Enterprise Resource Planning; Total Quality Management and Theory of constraints. Activity-Based Cost Management; Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.	**14**
V	Quantitative techniques for cost management; Linear Programming; PERT/CPM; Transportation problems; Assignment problems; Simulation; Learning Curve Theory.	**14**

Text Book/References Books/ Websites:

1. Cost Accounting A Managerial Emphasis; Prentice Hall of India; New Delhi.
2. Charles T. Horngren and George Foster; Advanced Management Accounting .
3. Robert S Kaplan Anthony A. Alkinson; Management & Cost Accounting.
4. Ashish K. Bhattacharya; Principles & Practices of Cost Accounting A. H. Wheeler publisher.
5. N.D. Vohra; Quantitative Techniques in Management; Tata McGraw Hill Book Co. Ltd.

Suggested List of Laboratory Experiments (Expandable): Nil

PEOPLE'S UNIVERSITY, BHOPAL

(Applicable for Admitted from Academic Session 2019-20 onwards)

Programme: Master of Technology Specialization: Thermal Engineering Semester –III

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External	Internal	Total (100)	External	Internal	Total
MT13201	Analysis of Thermal Power Cycles	3	1	-	(70)	(30)	Min: 40 (D Grade)	Nil	Nil	Nil

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 15	Assignment/Quiz/Attendance Max. Marks: 15
Practical Internal Max Marks: Nil	Lab work & Sessional – Max Marks: Nil	Assignment / Quiz/Attendance Max. Marks: Nil

Pre-Requisite	Student should have basic knowledge of Thermal Engineering.
Course Outcome	1. Determine the efficiency of thermodynamic cycles.
	2. Identify cycle components and describe their function
	3. performance characteristics and components of such power plants

Unit	Contents	Marks Weightage
I	Steam power plant cycle , Rankine cycle , Reheat cycle , Regenerative cycle with one and more feed heaters , Types of feed heaters , Open and closed types , Steam traps types.	**14**
II	Cogeneration , Condensing turbines , Combined heat and power , Combined cycles , Brayton cycle Rankine cycle combinations , Binary vapour cycle.	**14**
III	Air standard cycles , Cycles with variable specific heat , fuel air cycle , Deviation from actual cycle.	**14**
IV	Brayton cycle , Open cycle gas turbine , Closed cycle gas turbine , Regeneration , Inter cooling and reheating between stages.	**14**
V	Refrigeration Cycles , Vapour compression cycles , Cascade system , Vapour absorption cycles, GAX Cycle.	**14**

Text Book/References Books/ Websites:

1. R.Culp; Principles of Energy Conversion, McGraw-Hill, 2000.
2. P.K.Nag; Power Plant Engineering, 2nd Tata McGraw-Hill, 2002.
3. Nag. P.K., Engineering Thermodynamics, 3rd ed., Tata McGraw-Hill, 2005.
4. C.P Arora; Refrigeration and Air Conditioning, 2nd ed., Tata McGraw-Hill, 2004.

Suggested List of Laboratory Experiments (Expandable):- Nil

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Programme: Master of Technology Specialization: Thermal Engineering Semester –III

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External	Internal	Total (100)	External	Internal	Total
MTTE13202	Finite Element Method in Heat Transfer Analysis	3	1	-	(70)	(30)	Min: 40 (D Grade)	Nil	Nil	Nil

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 15	Assignment/Quiz/Attendance- Max. Marks: 15
Practical Internal Max Marks: Nil	Lab work & Sessional – Max Marks: Nil	Assignment / Quiz/Attendance- Max. Marks: Nil

Pre-Requisite	Student should have basic knowledge of engineering principles.
Course Outcome	1. Ability to understand about machine tool and cutting techniques.
	2. To understand maintenance and availability of machine.
	3. Study of different material for tools.

Unit	Contents (Theory)	Marks Weightage
I	Introduction, Weighted Residual Methods, Shape functions, Coordinate systems, Numerical Integration	**14**
II	Modeling of Heat Conduction, Variational Formulation, Galerkin's Approach for one dimensional and two dimensional problems	**14**
III	Introduction – A one dimensional Problem solved using a single element – Linear element, Quadratic element, the use of numerical integration. A one dimensional problem solved using an assembly of elements.	**14**
IV	Time stepping methods for Heat Transfer – Galerkin's approach in Non-linear transient heat conduction problems.	**14**
V	Introduction, Basic Equations, Galerkin's Methods for steady Convection – Diffusion problems, Upwind Finite Elements in One Dimension, Heat Transfer in fluid flow between parallel planes, Convection on melting and solidification.	**14**

Text Book/References Books/ Websites:

1. H. R. Thomas, K. N. Seetharamu, Ken Morgan, R. W. Lewis, "The Finite Element Method in Heat Transfer Analysis", John Wiley & Sons Inc, 1996.
2. Roland W. Lewis, Perumal Nithiarasu and K.N. Seetharamu, "Fundamentals of the Finite Element Method for Heat and Fluid Flow", Wiley; 1 edition, 2004.
3. J.N. Reddy and D.K. Gartling, "The Finite Element Method in Heat Transfer and Fluid Dynamics", CRC; 2 edition, 2000.

Suggested List of Laboratory Experiments :- (Expandable): Nil

PEOPLE'S UNIVERSITY, BHOPAL

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Programme: Master of Technology Specialization: Thermal Engineering Semester –III

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External	Internal	Total (100)	External	Internal	Total
MTTE13203	Computer Aided Design of Thermal System	3	1	-	External (70)	Internal (30)	Min: 40 (D Grade)	Nil	Nil	Nil

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 15	Assignment/Quiz/Attendance Max. Marks: 15
Practical Internal Max Marks: Nil	Lab work & Sessional – Max Marks: Nil	Assignment / Quiz/Attendance Max. Marks: Nil

Pre-Requisite	Nil
Course Outcome	1. To apply the knowledge of science and engineering fundamentals to design the thermal analysis using software.
	2. Abilities and capabilities in developing and applying computer software and hardware to mechanical design and manufacturing fields.
	3. Understand the principles and objectives of Maintenance Engineering.

Unit	Contents (Theory)	Marks Weightage
I	Basic Consideration in Design: Formulation of Design problems, conceptual design steps in design process computer aided design material selection.	14
II	Modeling of Thermal System: Types of model, mathematical & Physical modeling Dimensional Analysis Numerical modeling & simulation, simulation of thermal processes. Application to casting extrusion, heat treatment, Refrigeration systems, thermal design of heat engine.	14
III	Numerical Modeling & Simulation: Numerical modeling, System simulation, Methods for Numerical Simulation.	14
IV	Optimization: Basic Concepts, Objective function, constraints, Mathematical Formulation.	14
V	Optimization Methods: Calculus Method, search method linear & dynamic programming, Geometric Programming Introduction to Genetic Algorithms.	14

Text Book/References Books/ Websites:

1. Yogesh Jaluria; Design and Optimization of Thermal Systems, McGrawHill, New York.
2. Deb, Kalyanmoy; Optimization for Engineering Design, Prentice-Hall, New Delhi.
3. Design of thermal systems by W.F. Stocker
4. Design of optimization of thermal systems by Yogesh Jaluria
5. Optimization Techniques by Rao
6. Optimization Techniques & Genetic Algorithms by Kalyan Mchan Deb.

Suggested List of Laboratory Experiments :- (Expandable): Nil

PEOPLE'S UNIVERSITY, BHOPAL

(Applicable for Admitted from Academic Session 2019-20 onwards)

Programme: Master of Technology Specialization: Thermal Engineering Semester –III

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External (Nil)	Internal (Nil)	Total (100)	External (200)	Internal (100)	Total (300)
MTTE1303	Pre-Dissertation	-	-	6			Nil			Min: 120 (D Grade)

Duration of Theory (Externals): Nil

Theory Internal- Max Marks: Nil	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance Max. Marks: Nil
Practical Internal Max Marks: 300	Lab work & Sessional – Max Marks: 50	Assignment / Quiz/Attendance Max. Marks: 50

Pre-Requisite	Knowledge of concerned discipline of Engineering.
Course Outcome	1. Identify literature and problem identification of research.
	2. Apply engineering principles through efficient handling of project.
	3. Identify appropriate techniques to analyze complex engineering problems.

Unit	Contents (Theory)	Marks Weightage
	Pre- Dissertation: Students are required to select a topic of their interest in the third semester and prepare a dissertation on it. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available. End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions and must bring out individuals contribution. The student must submit a synopsis at the end of the semester for the approval from the research Approval committee in the specified format and submitted to the university for further Approval and give the power point presentation of the same for Evaluation/Approval.	**300**

Text Book/References Books/ Websites: Nil

Suggested List of Laboratory Experiments :- (Expandable): Nil