PEOPLE'S UNIVERSITY, BHOPAL

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

Programme: Master of Technology **Specialization: Production Engineering** **Semester –III**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External	Internal	Total (100)	External	Internal	Total
MT3101	Industrial Safety	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	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	**Introduction to Industrial Safety**: History and development of safety movement, Need for safety, Safety legislation: Acts and rules, Safety standards and codes, Safety policy: safety organization and responsibilities and authorities of different levels. Accident sequence theory, Causes of accidents, Accident prevention and control techniques, Plant safety inspections, Job safety Analysis and investigation of accidents, First aid. Financial costs-direct and indirect social costs of accidents. Compilation procedure for financial costs. Cost data, quality and its limitations-Budgeting.	**14**
II	**Hazards Identification:** Process Hazards Checklists, Hazards Surveys, Hazard Techniques, Hazards and Operability (HAZOP) Studies, Mechanical hazards; Machine Guarding, Safety with hand tools/ portable power tools. **Risk Assessment**: Review of Probability Theory, Event Trees, Fault Trees Analysis, QRA and LOPA, Risk Estimation and Management, Major hazard control, On-site and Off-site emergency preparedness, Industrial Waste Management.	**14**
III	**Industrial Hygiene:** Government Laws and Regulations, OSHA: Process Safety Management, EPA: Risk Management Plan, DHS: Chemical Facility Anti-Terrorism Standards (CFATS) Industrial Hygiene: Anticipation and Identification, Evaluation, Control. **Source Models:** Introduction to Source Models, Flow of Liquid through Holes, and Pipes, Flow of Gases or Vapors through Holes and Pipes, Flashing Liquids, Liquid Pool Evaporation or Boiling, Conservative Analysis.	**14**
IV	**Fires and Explosions:** The Fire Triangle, Distinction between Fires and Explosions, Definitions, Flammability Characteristics of Liquids and Vapors, Limiting Oxygen Concentration and Inerting, Flammability Diagram, Ignition Energy , Autoignition , Auto-Oxidation , Adiabatic Compression, Ignition Sources, Sprays and Mists, Explosions. **Concepts to Prevent Fires and Explosions:** Inerting, Static Electricity and its Control, Explosion-Proof Equipment and Instruments, Ventilation, Sprinkler Systems, Miscellaneous Concepts for Preventing Fires and Explosions.	**14**
V	**Occupational Health :**Occupational Health: Concept of health and occupational health, Spectrum of health, Occupational and work related diseases, Levels of prevention, History of occupational health, Characteristics of occupational diseases, Essentials of occupational health service, personal protective equipments (respiratory and non-respiratory)	**14**

PEOPLE'S UNIVERSITY, BHOPAL

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

Programme: Master of Technology **Specialization: Production Engineering** **Semester –III**

Text Book/References Books/ Websites:

1 H.H. Fawcett and W.S.Wood, Safety and Accident Prevention in Chemical Operations 2nd editon John Wiley and Sons Inc. (1982).
2. H. P. Garg ; Maintenance Engineering; S. Chand and Company.
3. Audels ; Pump-hydraulic Compressors; Mcgrew Hill Publication.
4. Winterkorn; Foundation Engineering Handbook 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: Production Engineering** **Semester –III**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External	Internal	Total (100)	External	Internal	Total
MT3102	Waste to Energy	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	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.eai.in/ref/ae/wte/typ/clas/india_industrial_wastes.html
6. 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: Production Engineering** **Semester –III**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External	Internal	Total (100)	External	Internal	Total
MT3103	Cost Management of Engineering Projects	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	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: Production Engineering** **Semester –III**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External	Internal	Total (100)	External	Internal	Total
MTPE3201	Optimization Techniques for Decision Making	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	Nil
Course Outcome	1. To understand the different optimization techniques with linear and non linear programming
	2. Understand the theoretical workings of the simplex method, the relationship between a linear program and its dual, including strong duality and complementary slackness.
	3. Solve specialized linear programming problems like the transportation and assignment problems, solve network models like the shortest path, minimum spanning tree, and maximum flow problems.

Unit	Contents (Theory)	Marks Weightage
I	**Introduction:** Engineering Application of Optimization, Multivariable Optimization Statement of Optimization Problem. Design Vector, Design Constraints, Objective Function and Classification of Optimization Problems.	**14**
II	**Classical Optimization Technique:** Single Variable Optimization, with Equality Constraints Solution by Direct Substitution, Solution by the method of Constrained Variation. Solution by the method of Lagrange multipliers, Multivariable Optimization with Inequality Constraints.	**14**
III	**Non-linear Programming:** (One Dimensional minimization method) Numerical method, Unimodal function, Unrestricted Search, Exhaustive search. Dichotomous Search, Fibonacci and Golden Section Method.	**14**
IV	**Interpolation Method:** Quadratic and Cubic Nonlinear Programming (Unrestricted Optimization Technique) Random Search Methods, Univariate method, Powels Method, Simplex method.	**14**
V	**Descent Methods:** Steepest Descent, Conjugate Gradient, Variable Metric Method. **Non Linear Programming:** (Constrained Optimization problem) Characteristic of a Constrained Problem.	**14**

Text Book/References Books/ Websites:

1. R.L Fox, Optimization methods for Engg. Design by Addison Wesley.
2. GSG Beveridge and R.S. Schechter, Optimization Theory and Practice by McGraw Hill.
3. RamVan, Optimization and Probability in System Engg. by Nostrand.

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

PEOPLE'S UNIVERSITY, BHOPAL

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Programme: Master of Technology **Specialization: Production Engineering** **Semester –III**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External	Internal	Total (100)	External	Internal	Total
MTPE3202	Agile Manufacturing	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	Nil
Course Outcome	1. To understand the quick production techniques and changes production techniques according to market trends.
	2. To understand the importance of manufacturing techniques for optimization.
	3. To understand the concepts of lean manufacturing and profitability.

Unit	Contents (Theory)	Marks Weightage
I	**Introduction:** Introduction to Agile Manufacturing, Competitive Environment of the future- The Business Case for Agile Manufacturing Conceptual Framework for Agile Manufacturing.	**14**
II	**Agile Manufacturing and Change Management:** Change Implications, Post Failures in Advanced Manufacturing, Changes on the way, Traditional Management Accounting, Paradigm, Investment Appraisal, Product Costing - Performance, Measurement and Control Systems.	**14**
III	**Four Core Concepts:** Strategy Driven Approach- Integrating Organization, People Technology Interdisciplinary Design Methodology.	**14**
IV	**Agile Manufacturing Enterprise Design:** Agile Manufacturing, Enterprise Design -System Concepts as the basic Manufacturing Theory-Joint Technical & Organizational Design as a model for the design of Agile Manufacturing Enterprise, Enterprise Design Process, Insights into Design Processes, Interdisciplinary Design, Main Issues - Simple Design Example.	**14**
V	**Skill & Knowledge Enhancing Technologies for Agile Manufacturing:** Skill and Knowledge enhancing Technologies -Scheduling -Technology Design Strategic.	**14**

Text Book/References Books/ Websites:

1. Paul T. Kidd; Agile Manufacturing -Forging new Frontiers; Addison Wesley- Publication.
2. Dr. M.P Chowdiah (Editor) Agile Manufacturing -Proceeding of International Conference on Agile Manufacturing,; TATA Mc Graw Hill Publications.
3. Paul T Kidd, Concurrent Engg ; Addison Wesley Publication.
4. Paul T Kidd, World Class manufacturing ; Addition Wesley.

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

PEOPLE'S UNIVERSITY, BHOPAL

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Programme: Master of Technology **Specialization: Production Engineering** **Semester –III**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External (70)	Internal (30)	Total (100)	External	Internal	Total
MTPE3203	Robust Design	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. Able to understand the market before production, collecting data from market for planning of production.
	2. Able to understand the development and quality engineering applications of Taguchi methods.

Unit	Contents (Theory)	Marks Weightage
I	**Quality by Experimental Design:** Quality, western and Taguchi quality philosophy, Elements of cost, Noise factors causes of variation, Quadratic Loss Function and Variation of Quadratic Loss Functions. **Robust Design:** Steps in Robust Design: Parameter Design and Tolerance Design, Reliability Improvement through Experiments, Illustration through Numerical Examples.	**14**
II	**Experimental Design:** Classical experiments: factorial experiments, terminology, factors. Levels, Interactions, Treatment combination, randomization, 2-level experimental design for two factors and three factors. 3-Level Experiment Deigns for two factors and three factors, factor effects, factor interactions, Fractional Factorial Design, Saturated Design, Central Composite Designs, Illustration through Numerical Examples**.**	**14**
III	**Measures of Variability:** Measures of variability, Concept of confidence level, Statistical Distributions: Normal, Log Normal and Weibull Distributions. Hypothesis testing, Probability plots, choice of sample size illustration through numerical examples.	**14**
IV	**Analysis and interpretation of experimental data:** Measures of variability, Ranking method, Column Effect Method and Plotting Method, Analysis of Variance (ANOVA), in factorial Experiment, YATE's Algorithm for ANOVA, Regression analysis, Mathematical Models from Experimental Data, illustration through Numerical Examples.	**14**
V	**Taguchi's Orthogonal Arrays :** Types Orthogonal Arrays, Selection of Standard Orthogonal arrays, Linear graphs and Interaction Assignment, Dummy Level Technique, Compound Factor Method, Modification of Linear Graphs, Column Merging Method, Branching Design, Strategies for Constructing Orthogonal Arrays.	**14**

Text Book/References Books/ Websites:

1. B Thomas. Barker, Quality by Experimental Design; Marcel Dekker Inc ASQC Quality Press.
2. C.F. Jeff Wu; Experiments Planning, Analysis and Parameter Design Optimization; Michael Hamada - John Wille.
3. W.L. Condra, Reliability Improvement by Experiments ; Marcel Dekker Inc ASQC Quality Press.

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

PEOPLE'S UNIVERSITY, BHOPAL

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Programme: Master of Technology **Specialization: Production Engineering** **Semester –III**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External	Internal	Total (100)	External	Internal	Total (300)
MTPE303	Pre-Dissertation	-	-	6	(Nil)	(Nil)	Nil	(200)	(100)	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: 100	Lab work & Sessional – Max Marks: 50	Assignment / Quiz/Attendance Max. Marks: 50

Pre-Requisite	Basic 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