PEOPLE'S UNIVERSITY, BHOPAL

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

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

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External	Internal	Total (100)	External	Internal	Total
MT1101	Research Methodology & IPR	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. Students will be able to understand research problem formulation.
	2. Able to analyze research related information and follow research ethics.
	3. Understand the importance of IPR and its protection for further research work.

Unit	Contents (Theory)	Marks Weightage
I	**Research Methodology**: Meaning; Objective & its types; Research Approaches ; Significance of Research; Research Methods Vs Methodology; Research Process; Criteria of Good Research; Meaning of research problem; Sources of research problem; Errors in selecting a research problem; Scope and objectives of research problem; Effective literature studies approaches; Plagiarism; Research Ethics; Problems Encountered by Researchers in India.	**14**
II	**Concept and Importance in Research:** Features of a good research design, Exploratory Research Design: concept types and uses, Descriptive Research Designs: concept, types and uses. Experimental Design: Concept of Independent & Dependent variables. Interpretation : Meaning & Technique; Precaution in Interpretation ; Significance of Report Writing; Layout of the Research Report ; Types of Reports; Precautions for Writing Research Reports ; Effective technical writing; Role of Computer software in report writing.	**14**
III	**Data Collection:** Collection of Primary Data ; Observation Method ; Interview Method ; Collection of Data through Questionnaires; Collection of Data through Schedules; Difference between Questionnaires and Schedules; Collection of Secondary Data.	**14**
IV	**Hypothesis**: Null Hypothesis & Alternative Hypothesis. Basic Concepts Concerning Testing of Hypotheses (Chi-square Test), Procedure for Hypothesis Testing; Flow Diagram for Hypothesis Testing. Qualities of a good Hypothesis.	**14**
V	**Nature of Intellectual Property:** Patents; Designs; Trade and Copyright. Process of Patenting and Development; technological research; innovation; patenting; development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents; Patenting under PCT. **Patent Rights:** Scope. Licensing and transfer of technology. Patent Information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System. IPR of Biological Systems.	**14**

Text Book/References Books/ Websites:

1. C . R. Kothari; Research Methodology; New Age Publication.
2. Wayne Goddard and Stuart Melville; Research Methodology: An Introduction.
3. Ranjit Kumar; 2 nd Edition ; Research Methodology: A Step by Step Guide for beginners.
4. Robert P. Merges; Peter S. Menell; Mark A. Lemley; Intellectual Property in New Technological Age.
5. T. Ramappa; Intellectual Property Rights Under WTO; S. Chand; 2008.

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 –I**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External	Internal	Total (100)	External	Internal	Total
MTPE102	Product Design and Development	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 complete details of product design.
	2. To know more about Basic elements of industrial design and manufacturing.

Unit	Contents (Theory)	Marks Weightage
I	**Introduction:** Characteristics of successful product development, Design and development of products, duration and cost of product development, the challenges of product development. **Development Processes and Organizations:** A generic development process, concept development: the front-end process, adopting the generic product development process.	**14**
II	**Product Planning:** The product planning process, identify opportunities. Evaluate and prioritize projects, allocate resources and plan timing, complete pre project planning. **Identifying Customer Needs:** Gather raw data from customers, interpret raw data in terms of customer needs, organize the needs into a hierarchy, establish the relative importance of the needs and reflect on the results and the process.	**14**
III	**Concept Generation:** The activity of concept generation clarifies the problem, search externally, search internally, explore systematically, and reflect on the results and the process. **Concept Selection and Testing:** Define the purpose of concept test, choose a survey population, choose a survey format, and communicate the concept, measure customer response.	**14**
IV	**Industrial Design:** Assessing the need for industrial design, the impact of industrial design, industrial design process, managing the industrial design process. **Design for Manufacturing:** Definition, estimation of manufacturing cost, reducing the cost of components, assembly, supporting production, impact of DFM on other factors. **Prototyping:** Prototyping basics, principles of prototyping, technologies, planning for prototypes.	**14**
V	**Product Development Economics:** Elements of economic analysis, base case financial mode, Sensitive analysis, project trade-offs, influence of qualitative factors on project success, qualitative analysis. **Managing Projects:** Understanding and representing task, baseline project planning, accelerating projects, project execution, postmortem project evaluation.	**14**

Text Book/References Books/ Websites:

1. Karl.T.Ulrich, Steven D Eppinger; Product Design and Development ; Irwin McGrawHill .
2. A C Chitale and R C Gupta Product Design and Manufacturing by PH1.
3. Timjones. Butterworth Heinmann, New Product Development by Oxford. UCI -1997
4. Geoffery Boothroyd, Product Design for Manufacture and Assembly ;Peter Dewhurst and Winston Knight – 2002

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 –I**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External	Internal	Total	External	Internal	Total
MTPE103	Mechanical Measurement and Metrology	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. Able to measure the various parameters like length, height, angle, displacement, flatness etc., by using various instruments like vernier calipers, micrometer, dial indicator, etc.
	2. Understand the importance of precision and accuracy.

Unit	Contents (Theory)	Marks Weightage
I	**Limits and Fits, ISO system:** Fits and Types of interchangeability, Taylor's Principle or plain limit gauges, Use of Plug, Ring and Snap gauges. Indicating type limit gauges. Introduction-Linear and Angular measurements - Slip Gauges and End bars - Gauge material and manufacturing methods, Different types of Micrometers, Height gauges Tomlinson gauges. Precision polygon, Sine bar, Auto collimator.	**14**
II	**Comparators:** Dial indicator, Sigma and Mechanical comparator, Free flow and Back pressure type Pneumatic Comparator. Application of set jet gauge heads Optical projector, Chart, screen gauges and Measuring Methods, Micro Gauge Bridge Lines. Tool maker's Microscope applications. Measurement of Straightness and- Flatness. Roundness measurement with bench centers and Talyround, Coordinate Measuring Machine in Components Geometries.	**14**
III	**Surface Roughness Measurements:** Parameters as per ISO indices. Profilometer, Taylor Hobson Talysurf. Application of Thread metrology - 2 wire and 3 Wire methods, Gear Measurement - Gear tooth thickness, Parkinson gear tester, General Geometric Tests for testing Machine Tools-Lathe, drill, mill.	**14**
IV	**Elements of Instrumentation System:** Static and Dynamic characteristics. Types of errors. Displacement transducers. LVDT. Strain measurement - Wire and foil type resistance strain gauges. Rosette Gauges. Bonding procedure. Lead resistance compensation. Adjacent arm and self compensating gauges. Proving ring Strain gauge load cells, measurement of axial load and torsion by strain gauges. Piezo electric load cell.	**14**
V	**Introduction to Seismic Transducer:** displacement and acceleration measurement, Pressure Measurement - Bourdon Pressure Gauge, Bulk Modulus Gauge, Pirani Gauge, Temperature Measurement by Thermo Couples. Laws of Thermo Electricity. Types of Materials used in Thermocouples. Protection tubes Extension wire. Series and Parallel Circuits. Ambient Temperature Compensation.	**14**

Text Book/References Books/ Websites:

1. I C Gupta, Engineering Metrology, Danpat Rai Publications, New Delhi.
2. Rega Rajendra, Principles of Engineering Metrology, Jaico Publishing House, Mumbai.
3. V S R Murti, Metrology and Surface Engineering, Frontline Publications, 2011
4. R.K Jain, Engineering Metrology, Khanna Publications, 1996
5. Doeblin, Measurement Systems Application and Design, Tata McGraw Hill, 5thed., 2004.
6. Beckwith, Buck, Lienhard, Mechanical Measurements, Pearson Education Asia.

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 –I**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External (70)	Internal (30)	Total (100)	External	Internal	Total
MTPE104	Advanced Materials Technology	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	Basics knowledge of Engineering materials and its properties.
Course Outcome	1. To study about material behavior during production.
	2 To understand more advance techniques in manufacturing.

Unit	Contents (Theory)	Marks Weightage
I	**Introduction to Composite Materials:** Definition, Classification, Types of matrices & reinforcements, characteristics &selection, Fiber composites, laminated composites, particulate composites, sandwich construction. **Micro Mechanical Analysis of a Lamina:** Introduction, Evaluation of the four elastic modules Rule of mixture, ultimate strengths of unidirectional lamina.	**14**
II	**Macro Mechanics of a Lamina:** Hooke's law for different types of materials, number of elastic constants, Two – Dimensional Relationship of Compliance & Stiffness Matrix. Hooke's Law for two dimensional angle lamina, engineering constants – angle lamina, Invariants, Theories of failure.	**14**
III	**Macro Mechanical Analysis of Laminate:** Introduction, code, Kirchhoff hypothesis – CLT, A, B, & D matrices, Engineering constants, Special cases of laminates, Failure criterion. **Manufacturing:** Layup and curing – open and closed mould processing, Hand lay –up techniques – Bag moulding and Filament Winding. Pultrusion, performing, Thermoforming, Injection moulding, Cutting, Machining and joining, Tooling, Quality assurance – Introduction, Material Qualification, types of defects, NDT methods.	**14**
IV	**Application Developments -** Aircrafts, Missiles, Space Hardware, Automobile, Electrical and Electronics, Marine, Recreational and Sports Equipment-Future Potential Of Composites.	**14**
V	**Metal Matrix Composites:** Reinforcement Materials, Types, Characteristics & Selection, Base Metals- Selection, Applications.	**14**

Text Book/References Books/ Websites:

1. Mel M Schwartz; Composite Materials Handbook; Tata McGraw-Hill.
2. B K Datta, Powder Metallurgy: An Advanced Technique of Processing Engineering Materials; PHI Publication.
3. J P Den Hartog, Advanced Strength of Materials; kindle Publication.
4. Louise Ferrante, Handbook of Advanced Materials Testing; CRC Press Book.

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 –I

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External	Internal	Total	External	Internal	Total
MTPE105	Finite Element Methods	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 product lifecycle.
	2. General knowledge of FEM including basic to detailed discussion.

Unit	Contents (Theory)	Marks Weightage
I	**Introduction:** Equations of equilibrium, stress-strain relations for 2-D and 3-D, Potential energy and equilibrium, Boundary conditions, Von Misses Stresses	**14**
II	**FEM for 1-D Problems:** General procedure for FEA, Rayleigh Ritz method, Galerkin's Approach, shape functions, stiffness matrix, load vectors, temperature effects, Applications of boundary conditions using elimination, penalty and multi-constraint approaches, Application problems – 1-D bar element. Trusses and beams	**14**
III	**FEM for 2-D Problems**: Shape functions, stiffness matrix, strain matrix, load vectors for CST Elements and application problems **FEM for Axi symmetric Problems**: Ax symmetric formulation, triangular elements, PE approach, Body force term, application problems	**14**
IV	**FEM for Scalar Field Problems:** 1-D Steady State Heat Transfer, Torsion, Potential Flow and fluid flow in ducts and Application Problems	**14**
V	**Dynamic Analysis:** Equations of motion for dynamic problems, consistent and lumped mass Matrices, Formulation of Element Mass Matrices Free Vibration and Forced Vibration Problems Formulation.	**14**

Text Book/References Books/ Websites:

1. R Tirupathi, D.Chandrupatla,Ashok Belegundu; Introduction to Finite Elements in Engineering; Prentice Hall India Pvt. Ltd.
2. R.D Cook, D.S Malkus & M.E Plesha; Concepts and Applications of finite Element Analysis, John Wiley & Sons.
3. L.J Segerlind; Applied Finite Element Analysis; John Wiley & Sons.
4. SS Rao & Pergomon; Press the Finite Element Method in Engineering; Oxford.
5. K .J Bathe; Prentice Finite Element Procedures in Engineering Analysis; Hall NewJersey .

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 –I**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External	Internal	Total	External	Internal	Total (100)
MTPE106	CAD/CAM Lab	-	-	2	(Nil)	(Nil)	Nil	(70)	(30)	Min: 40 (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: 30	Lab work & Sessional – Max Marks: 15	Assignment / Quiz Attendance Max. Marks: 15

Pre-Requisite	Basic Knowledge of Product Designing Software.
Course Outcome	1. Understand the role of CAD/CAM in modern design and manufacturing;
	2. Able to understand the principles of CAM systems.
	3. Able to Performing Operations and programming of CNC machine

Unit	Contents (Theory)	Marks Weightage
	Solid Modeling Software: Anyone solid modeling software from Autodesk Inventor, CATIA, SOLID EDGE, SOLIDWORKS, UNIGRAPHICS etc as assigned by the faculty. Students will be required to learn the methods related to Sketching, part modeling, assembly, wireframe / surfacing modeling & Drafting of various mechanical components. Numerical Control Fundamental, CNC Part Programming, Computer Aided Manufacturing, Simulation software's, Material handling, Flexible manufacturing systems.	**100**

Text Book/References Books/ Websites:

1. Zeid I., CAD / CAM problem & practice, 3rd Edition, Tata McGraw Hill, 2001.
2. K.K Bathe; Finite Element Procedures; Prentice Hall of India.
3. A.M Kuthe; Computer Graphics including CAD, AutoCAD & C", by ,S.Chand, 2005
4. P.N Rao; CAD/CAM Principles &Applications; Tata Mc Graw Hill, 2002.

Suggested List of Laboratory Experiments :- (Expandable):

1. Students should prepare atleast five drawing sheets of different modules of Mechanical components by using solid modeling software.
2. Exercises on Manual CNC Part programming using G& M codes
3. Machining of parts on CNC Machines including preparation of part program, after simulation of tool path using suitable CAM software package
4. Part Programming using CAM software like MASTERCAM
5. Study of simulation software Like, MATLAB.
6. Simulation of Job shop with material handling and Flexible manufacturing systems

PEOPLE'S UNIVERSITY, BHOPAL

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

Programme: Master of Technology Specialization: Production Engineering Semester –I

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External	Internal	Total	External	Internal	Total (100)
MTPE107	Production Technology Lab	-	-	2	(Nil)	(Nil)	Nil	(70)	(30)	Min: 40 (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: 30	Lab work & Sessional – Max Marks: 15	Assignment / Quiz Attendance Max. Marks: 15

Pre-Requisite	Nil
Course Outcome	1. To demonstrate a basic and advanced understanding of Electrical Discharge Machining (EDM) & Wire Electrical Discharge Machining (WEDM), Sensors and Actuators, Rapid Prototyping (RP) machine.
	2. Perform thread cutting operation as per the diagrams and compare with standard thread gauges.
	Describe the construction & working of shaping, milling &drilling machines and gear cutting & finishing process.

Unit	Contents (Theory)	Marks Weightage
	Wire Electrical Discharge Machining (WEDM), Electrical Discharge Machining (EDM), Rapid Prototyping (RP) process, Modification in Production system with Different Sensors, Modification in Production system with Different Actuators, Milling, Shaper Machine Lathe Machine drilling machine etc.	**100**

Text Book/References Books/ Websites:

1. Hajra Chaudhary ; Workshop Technology; Media Promoters & Publishers Pvt. Ltd. Mumbai
2. Suresh Dalela ;;Manufacturing Science and Technology Vol. I & II.; Umesh Publication
3. B. S. Raghuvanshi ; Workshop Technology Vol. I And II; Dhanpat Rai & Sons
4. R. K. Jain ; Production Technology; Khanna Publishers, Delhi
5. P.N. Vijayvargiya , Machine Tool Shilp Vigyan (Hindi); Deepak Prakashan, Gwalior

Suggested List of Laboratory Experiments :- (Expandable)

1. Study and demonstration of WEDM
2. Study and demonstration of RP machine.
3. Study and demonstration of Die sinking EDM.
4. Study and demonstration of various Sensors.
5. Study and demonstration of Various Actuators

PEOPLE'S UNIVERSITY, BHOPAL

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Programme: Master of Technology Specialization: Production Engineering Semester –I

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External	Internal	Total (50)	External	Internal	Total
MT108	Audit Course - I (Value Education)	-	-	-	(35)	(15)	Min: 20 (D Grade)	Nil	Nil	Nil

Duration of Theory (Externals): 2 Hours

Theory Internal- Max Marks: 15	Best of Two Mid Semester Test – Max Marks: Nil	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. Knowledge of self-development.
	2. Learn the importance of Human values.
	3. Developing the overall personality.

Unit	Contents (Theory)	Marks Weightage
I	Values and self-development –Social values and individual attitudes; Work ethics, Indian vision of humanism; Moral and non- moral valuation; Standards and principles; Value judgments.	**07**
II	Importance of cultivation of values; Sense of duty. Devotion, Self-reliance. Confidence, Concentration; Truthfulness, Cleanliness; Honesty, Humanity; Power of faith, National Unity; Patriotism. Love for nature, Discipline	**07**
III	Personality and Behavior Development - Soul and Scientific; attitude; Positive Thinking. Integrity and discipline; Punctuality, Love and Kindness; Avoid fault Thinking; Free from anger, Dignity of labour.	**07**
IV	Universal brotherhood and religious tolerance; True friendship; Happiness Vs suffering, love for truth; Aware of self-destructive habits; Association and Cooperation; Doing best for saving nature.	**07**
V	Character and Competence –Holy books vs Blind faith; Self-management and Good health.; Science of reincarnation; Equality, Nonviolence, Humility, Role of Women; All religions and same message; Mind your Mind, Self-control; Honesty, Studying effectively.	**07**

 # Mandatory (Non Credit) subject according to AICTE. Non University Examination, End Sem marks not to be included in total marks and credit. Students must pass in this subject.

Text Book/References Books/ Websites:

1. S.K. Chakroborty; Values and Ethics organizations Theory and practice; Oxford University Press, New Delhi.

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