PEOPLE'S UNIVERSITY, BHOPAL

(Applicable for Admitted from Academic Session 2022-23 onwards)

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

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External	Internal	Total (100)	External	Internal	Total
MTTR101	Research Methodology & IPR	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 will be able to understand research problem formulation.
	2. They will have knowledge to analyze research related information and follow research ethics.
	3. Students will apply their knowledge in the importance of IPR.

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.	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.	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, 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.	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.

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

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

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External	Internal	Total (100)	External	Internal	Total
MTTR102	Transportation Systems	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 - Max. Marks: Nil

Pre-Requisite	Transportation Engineering.
Course Outcome	1. Students will have knowledge of road plans and transport policy.
	2. Student will apply their knowledge in design of runway and taxiway.
	3. Student will able to understand about urban transportation systems.

Unit	Contents (Theory)	Marks Weightage
I	**Historical Development of Transport In India:** 20 year Road Plans, National Transport Policy Recommendations, IRC, CRRI, Vision 2021, NHDP, PMGSY. Characteristics of different modes of transport and their integration and interactions impact on environment.	14
II	**Planning of Railway:** Passenger and goods terminals, layout, Passenger facilities traffic control.	14
III	**Airport Planning:** Requirements and components, Design of runway and taxiway Apron parking configuration, terminal requirements, Airport marking and lighting Air traffic control.	14
IV	**Planning of Harbours and Ports:** Cargo handling, Containerization, Navigation aids Inland waterways, Pipeline transportation.	14
V	**Urban Transportation Systems:** Mass rapid transit system, Light rail transit, Personal rapid transit, Guided way systems, Cabin taxi, Dual mode bus, Para transit systems, Demand responsive system, Intermediate public transport.	14

Text Book/References Books/ Websites:

1. R.J. Paquette; et al, Transportation Engineering Planning and Design; John Wiley & Sons; New York, 1982.
2. Alan Black; Urban Mass Transportation Planning; McGraw-Hill, 1995.

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

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

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External (70)	Internal (30)	Total (100)	External (Nil)	Internal (Nil)	Total
MTTR103	Alignment & Geometric Design of Highways	3	1	-			Min: 40 (D Grade)			(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	Highway Engineering.
Course Outcome	1. The student will have an idea of types of highway.
	2. Students will apply their knowledge in horizontal and vertical alignment.
	3. Student will able to understand highway financing and administration.

Unit	Contents (Theory)	Marks Weightage
I	**Principle of Route Selection and Highways Location:** Reconnaissance, Preliminary and final location surveys. Different Studies for Route Locations, Traffic, Soil and Materials, Drainage etc. Use of aerial photographs and remote sensing in route location, Preparation and presentation of project documents.	14
II	**Highway Financing, Economics and Administration:** Financing of Highways, revenues and expenditures, Highway financing in India. Economics of highway improvements, Highway administration and planning in India, Saturation system.	14
III	**Classification of Highway:** Terrain classification, Design speed and other factor for Geometric design, Uniform and non-uniform acceleration theory. **Cross Sectional Elements:** Road lines, Building and control lines, Roadways, Width, shoulders. Median, Camber. **Sight Distances:** Analysis of stopping sight distance, Intermediate and passing sight distance.	14
IV	**Horizontal Alignment:** Design Radius, Dynamics and motion of vehicle on a curve, Friction between tyre and road surface, Different curves, Super-elevation, Widening and transition curves, Setting of transition spiral, Use of tables.	14
V	**Vertical Alignment:** Gradients, Grade compensation, Relation between gradient and camber, Design of summit and valley curves, Design criteria for hair pin bend, Design of curves in tight location, Lateral and vertical clearances, Under passes, Coordination of horizontal and vertical, Set back distance.	14

Text Book/References Books/ Websites:

1. IRC-73-1980; Geometric Design Standards for Rural Highways.
2. IRC-52-1970; Design Tables for Horizontal Curves for Highways.
3.IRC-52-1973; Recommendation about the Alignment Survey Geometric Design of Hill Roads.

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

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

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External (70)	Internal (30)	Total (100)	External (Nil)	Internal (Nil)	Total
MTTR104	Soil Mechanics in Highway Engineering	3	1	-			Min: 40 (D Grade)			(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	Geotechnical Engineering.
Course Outcome	1. The student will have an idea of bearing capacity of soil.
	2. Student will be conversant with CBR value.
	3. The student will be able to know about soil stabilization.

Unit	Contents (Theory)	Marks Weightage
I	**Classification of Soils:** IS Classification, AASHTO classifications, CAA classifications, Introduction to geotechnical investigations, Different methods of investigation, Trial pits, Rotary drilling, Percussion drilling, Geophysical methods. Introduction to rock engineering, core recovery, Rock quality designation, Joint condition, Joint orientation rock mass rating, Crushing strength, Point load index, Rock durability test, Pressure meter test, Percolation tests.	14
II	**Compaction:** Theory of compaction, Factors affecting compaction, Effect of compaction on soil, Properties, Measurement of field compaction and field methods of compaction and control. **CBR and Group Index:** Laboratory and field determination of CBR value, Effect of soaking, Modules of sub-grade reaction.	14
III	**Bearing Capacity:** Skempton's analysis, Plate Load Test, Penetration tests, General bearing capacity equation, Effect of water table on bearing capacity. **Stability of Slopes:** Types of slope failure, Bishop's slope stability analysis, Stability number.	14
IV	**Earth Pressures:** Classical theories, Effect of submergence and seepage.	14
V	**Soil Stabilization:** Mechanics of stabilization, Mechanical, Electrical, Cement, Lime, Bitumen and chemical stabilization. **Drainage:** Vertical and sand drains, Surface and sub-surface drainage for highways, Drainage for hill roads.	14

Text Book/References Books/ Websites:

1. Alam Singh; Soil Engineering in Theory and Practice; Asia Publication House.
2. HMSO; Soil Mechanics for Road Engineers.
3. S. K. Khanna and Justo C.G; Highway Engineering; Nem Chand, 1973
4. B.C. Punmia; Soil Mechanics and Foundation Engineering; Laxmi Publications.

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

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

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External (70)	Internal (30)	Total (100)	External (Nil)	Internal (Nil)	Total
MTTR105	Material Science & Concrete Technology	3	1	-			Min: 40 (D Grade)			(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	Material Technology.
Course Outcome	1. They will possess the skills to solve problems in creep & fatigue.
	2. They will have knowledge about testing of concrete.
	3. Student will able to understand mix design.

Unit	Contents (Theory)	Marks Weightage
I	**Structure of Solid Materials:** Atoms and bonds, Inter-atomic and intermolecular bond, Crystals, Classification of solids. Mechanism of elastic and plastic action in tension, Compression, Pure bending and torsion, Elastic and inelastic properties of solids, Dislocations, Strain hardening, Triaxial stress	14
II	**Creep:** Components of creep fracture, Analysis of creep curves, Method of predicting creep strength, Designing of creep. **Fatigue:** Fatigue loading, Mechanism, Factor affecting creep fatigue properties, S.N. diagrams. **Hardness:** Relation between hardness of different atomic structure measurement of hardness with other mechanical properties.	14
III	**Concrete Materials:**Cement manufacture, Composition, Structure, Hydrated cement paste, Heat of hydration, Test for physical properties, Different types of cements, Properties of aggregates. **Fresh Concrete:** Workability, Factor affecting, Testing, Vibration analysis of fresh concrete. **Strength of Concrete:** Nature of strength, Factor affecting, Autogenous heating, Maturity of concrete, Fatigue strength, Impact strength. Admixtures & plasticizers.	14
IV	**Elasticity Shrinkage And Creep:** Modulus of elasticity, Dynamic Modulus, Poisons ratio, Early volume changes, Swelling, Shrinkage, Creep factors influencing creep nature. Rheological models, Effects and design of creep. **Durability of Concrete:** Permeability of concrete, Thermal properties of concrete, Resistance of concrete to fire, Resistance to abrasion, Electrical properties, Acoustic properties, Chemical attack	14
V	**Testing of Hardended Concrete:** Destructive and non destructive testing of concrete, Tests of composition of hardened concrete, Variation of test results, Accelerated testing of concrete. **Mix Design:** Basic consideration, Factor in choice of mix. Proportion, Method of mix design, I.S. Code method, I.B.C. Murdock, A.C.I. method based on road note No.4,	14

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

	Design of different types of concrete: Light weight and high density.	

Text Book/References Books/ Websites:

1. A. M. Neville, J.J. Brooks ; Concrete Technology; By Pearson.
2. M. S. Shetty; Concrete Technology ; Paperback,

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

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

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P			Total			Total (100)
MTTR106	Soil Mechanics Lab	-	-	2	External (Nil)	Internal (Nil)	(Nil)	External (70)	Internal (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	Concrete technology
Course Outcome	1. Students will understand the basic knowledge of Indian standard light compaction test.
	2. Students will be able to understand the use of Indian standard heavy compaction test.
	3. Students will have knowledge about the use of determination of field density.

Unit	Contents (Theory)	Marks Weightage
I	**Testing of cement:** Consistency, Fineness, Setting time, Specific Gravity, Soundness and strength.	100
II	**Testing of aggregate:** Testing of fine aggregate- Specific Gravity, Sieve analysis and zoning, Bulking of fine aggregate, Bulk density, Silt content. **Testing of coarse aggregate:** Specific Gravity, Sieve analysis, Bulk density, Flakiness index, Elongation index, Water absorption & moisture content, Soundness of aggregate, Concrete mix design by ACI 211.1-91 method, IS code method as per 10262- 2007 & 456-2000, DOE method tests on concrete.	
III	**Workability tests:** Slump cone test, Compaction factor test, Vee-bee consistometer test, Flow table test.	
IV	**Strength tests:** Compressive strength, Flexural strength, Split tensile strength. Effects of admixture: Accelerator, Retarder, Super plasticizer	
V	**Non-destructive Testing:** Rebound hammer test, Ultrasonic pulse velocity test.	

Text Book/References Books/ Websites:

1. Building and construction materials; M.L. Gambhir; McGraw Hill Education
2. H.E. Davis;.Testing of engineering materials; Mc Graw hill india.
3. Lab manual prepared by department of civil engineering.

Suggested List of Laboratory Experiments:-

1. To determine the consistency of cement.
2. To determine the fineness of cement.
3. To determine the specific gravity of aggregate.
4. To determine the bulk density of aggregate.
5. Determination of workability.
6. Determination of Soundness.
7. To study Sieve analysis and zoning.

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

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P			Total			Total (100)
MTTR107	Computer Aided Design Lab	-	-	2	External (Nil)	Internal (Nil)	(Nil)	External (70)	Internal (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 applications of computer.
Course Outcome	1. Students will be able to understand the concept of auto CAD.
	2. Students will be conversant with modifying Tools.
	3. They possess the skill to solve problem in plan a commercial.

Unit	Contents (Theory)	Marks Weightage
I	**Basic AutoCAD Drawing Tools:** Lines, Circle, Arc, Polyline, Multiline, Polygon, Rectangle, Spline, Ellipse. **Modifying Tools:** Erase, Copy, Mirror, Offset, Array, Move, Rotate, Scale, Stretch, Lengthen, Trim, Extend, Break. **Chamfer and Fillet Text:** Single line, Multi line, Spelling, Edit text. **Special Features:** View tools, Layers concept, Dimension tools, Hatching, Customizing tool bars, Working with multiple drawings. Plan a commercial/Residential/Industrial/Institutional building using Auto CAD. Draw cross section of foundation, Masonry wall, RCC columns isolated & combined footing using AutoCAD.	100

Text Book/References Books/ Websites:

1. AutoCAD 2013 and AutoCAD LT 2013; Ellen Finkelstein; John Wiley & Sons.
2. Mastering AutoCAD 2012 and AutoCAD LT 2012; George Omura; Sybex
3. AutoCAD, SolidEdge, Cadlab software and Manuals.

Suggested List of Laboratory Experiments:-

- Practicing plan, section and elevation of residential buildings.
- Practicing plan, section and elevation of commercial buildings.
- Practicing plan, elevation and side view of institutional buildings.

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

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External	Internal	Total (50)	External	Internal	Total
MTTR108	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. Students will have knowledge of self-development.
	2. Students will learn the importance of human values.
	3. Students will be 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 behaviour 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	**Brotherhood and Religious Tolerance:** 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

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