DEPARTMENT OF CIVIL ENGINEERING

COURSE STRUCTURE & SYLLABUS
For PG - R22
M. TECH (TRANSPORTATION ENGINEERING)

(Applicable for batches admitted from 2022-2023)

St. Ann' S COLLEGE OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)
CHIRALA – 523187, ANDHRA PRADESH, INDIA

(Accredited by NBA, NAAC with 'A' Grade, accredited by IE (I) & Permanently Affiliated to JNTUK) Recognized by UGC under Section 2(f) & 12(B) of UGC Act,

I-SEMESTER

S. No	Category	Course Code	Course Title	Theory/ Lecture (L)	Tutorial (T)	Practical/ Drawing (P)	Self-Study (SS)	Duration in hours/ Week	CIE Marks	SEE Marks	Total Marks	Credits
1	PC	22PTR01	Advanced Highway Engineering	3	--	--	--	3	40	60	100	3
2	PC	22PTR02	Advanced Traffic Engineering	3	--	--	--	3	40	60	100	3
3	PE	22PTR03	Bridge Engineering	3	--	--	--	3	40	60	100	3
		22PTR04	Project Management									
		22PTR05	Ground Improvement									
4	PE	22PTR06	GIS for Transportation	3	--	--	--	3	40	60	100	3
		22PTR07	Pavement Management system									
		22PTR08	Transportation Modeling and Simulation									
5	CC	22PTR09	Research Methodology and IPR	0	--	--	--	--	40	60	100	2
6	PC	22PTR10	Highway Aggregate Lab	0	--	4	--	4	40	60	100	2
7	PC	22PTR11	Bituminous Testing lab	0	--	4	--	4	40	60	100	2
8	MC	-	Audit Course-1*	2	--	--	--	2	40	60	100	0
Total				14	0	8	0	22	320	480	800	18

HS-Humanities & Sciences, BS-Basic Sciences, ES-Engineering Sciences, MC-Mandatory Course (*Student has to choose any one audit course listed below.), PC-Professional Core, PE-Professional Elective, OE-Open, Elective, PR – Internship / Project

Audit Course 1 & 2:

22PAC01: English for Research Paper Writing
22PAC02: Disaster Management
22PAC03: Sanskrit for Technical Knowledge
22PAC04: Value Education
22PAC05: Constitution of India
22PAC06 Pedagogy Studies
22PAC07: Stress Management by Yoga
22PAC08: Personality Development through Life Enlightenment Skills

II-SEMESTER

S. No	Category	Course Code	Course Title	Theory / Lecture (L)	Tutorial (T)	Practical/ Drawing (P)	Self-Study (SS)	Duration in hours/ Week	CIE Marks	SEE Marks	Total Marks	Credits
1	PC	22PTR13	Pavement Analysis & Design	3	--	--	--	3	40	60	100	3
2	PC	22PTR14	Transportation Planning	3	--	--	--	3	40	60	100	3
3	PE	22PTR15	Pavement Construction	3	--	--	--	3	40	60	100	3
		22PTR16	Environment Impact Assessment									
		22PTR17	Traffic Flow Analysis									
4	PE	22PTR18	Design and maintenance of Rural Roads	3	--	--	--	3	40	60	100	3
		22PTR19	Highway Safety Engineering									
		22PTR20	Intelligent Transportation Systems		--							
5	PC	22PTR21	Advanced Transportation engineering Lab	--	--	4	--	4	40	60	100	2
6	PC	22PTR22	Transportation Simulation lab	--	--	4	--	4	40	60	100	2
7	PR	22PTR23	Mini Project with Seminar	--	--	4	--	4	100	--	100	2
8	MC	-	Audit Course-2*	2	--	--	--	2	40	60	100	0
Total				14	0	12	0	26	380	420	800	18

HS-Humanities & Sciences, BS-Basic Sciences, ES-Engineering Sciences, MC-Mandatory Course (*Student has to choose any one audit course listed below.), PC-Professional Core, PE-Professional Elective, OE-Open, Elective, PR – Internship / Project

Audit Course 1 & 2:

22PAC01: English for Research Paper Writing
22PAC02: Disaster Management
22PAC03: Sanskrit for Technical Knowledge
22PAC04: Value Education
22PAC05: Constitution of India
22PAC06: Pedagogy Studies
22PAC07: Stress Management by Yoga
22PAC08: Personality Development through Life Enlightenment Skills

III-SEMESTER

S. No	Category	Course Code	Course Title	Theory/ Lecture (L)	Tutorial (T)	Practical/ Drawing (P)	Self-Study (SS)	Duration in hours	CIE Marks	SEE Marks	Total Marks	Credits
1	PE	22PTR25	Economics of Infrastructure & Transportation projects	3	--	--	--	3	40	60	100	3
		22PTR26	Airport, Railway & Harbor Engineering									
		22PTR27	Transportation System Management									
2	OE	22PTE28	Composite Material	3	--	--	--	3	40	60	100	3
		22PTR29	Land Use and Regional Transportation Planning									
		22PTR30	Operation Research									
3	PR	22PTR31	Core Dissertation Phase-I / Industrial Project (To be continued and Evaluated next Semester)*	3	--	--	--	3	--	100	100	10
TOTAL				12	0	0	0	12	120	280	400	16

HS-Humanities & Sciences, BS-Basic Sciences, ES-Engineering Sciences, MC-Mandatory Course (*Student has to choose any one audit course listed below.), PC-Professional Core, PE-Professional Elective, OE-Open, Elective, PR – Internship / Project

IV-SEMESTER

S. No	Category	Course Code	Course Title	Theory/ Lecture (L)	Tutorial (T)	Practical/ Drawing (P)	Self-Study (SS)	Duration in hours	CIE Marks	SEE Marks	Total Marks	Credits
4	RP	22PTR32	Core Dissertation Phase-I / Industrial Project (To be continued and Evaluated next Semester)*	3	--	32	--	3	--	100	100	16
Total				3	0	32	0	3	0	100	100	16

I Year-I Semester	22PTR01	L	T	P	C
		3	0	0	3

Advanced Highway Engineering

UNIT–I

Geometric Design of Highways: Functional classification of Highway system; Design controls Topography, Driver characteristics, Vehicle characteristics. Traffic, Capacity and Level of Service, Design speed Objectives of Geometric Design. Road Margins-design specifications; Pavement surface characteristics-Skid Resistance, measurement of skid resistance; Road roughness, measurement of Road roughness; Camber design and standards.

UNIT-II

Horizontal and Vertical Alignment: Sight Distance-SSD, OSD and ISD. Horizontal curves, Super elevation; computing of super elevation; attainment of super elevation; extra widening on curves; Transition curves-Objectives and Design. Gradients- Types of Gradients, Design Standards; Summit Curves, Valley curves and Design criteria. Combination of Vertical and Horizontal curves- Grade Compensation. Importance of Sight Distances for Horizontal and Vertical curves.

UNIT- III

Design of Inter sections: Types of Inter sections; Design Principles for Inter sections; Design At-grade Inter sections–Channelization, Objectives; Traffic Island sand Design standards Rotary Intersection-Concept, Advantages and Disadvantages; Grade separated Inter changes-Types, warrants and Design standards as per IRC.

UNIT-IV

Traffic Signs and Road Markings: Types of Road Signs; Guide lines for the provision of Road Signs; Caution Signs, Regulatory signs. Information signs – Design standards. Road markings-Objectives of Road markings; Types of Road Marking, Role of Road markings in Road Safety and Traffic Regulation; Specification for Road Marking Highway Appurtenances-Delineators, Traffic Impact Attenuators, Safety Barriers.

UNIT–V

Pedestrian Elements: Requirements of Pedestrians; Pedestrian facilities on Urban Roads; Cycle Tracks-Guide line sand Design standards; Bus Bays- Type sand Guide Lines- Design of on street and Off-street parking facilities-Guide lines for layout Design. Design of Sub way sand foot over bridges.

Suggested Reading

1. Principles and Practice of Highway Engineering, L.R. Kadiyali and N.B.Lal, Khanna Publications.
2. Text Book of Highway Engineering, R. Srinivasa Kumar, Universities Press,2011.
3. Highway Engineering, C.E.G. Justo and S.K. Khanna, NemChandand Brothers
4. IRC Codes for signs, Markings and Mixed Traffic Control in Urban Areas.

I Year-I Semester	22PTR02	L	T	P	C
		3	0	0	3

Advanced Traffic Engineering

UNIT-I

Basic Aspects of Traffic Engineering Aim of traffic engineering, traffic stream components and characteristics, road user characteristics, vehicle characteristics, acceleration characteristics, measures of quality, measures of separation, relation ship among traffic parameters and empirical relationships, mechanics of traffic flow, macroscopic approach, microscopic-approach and human factors approach, discrete distributions, binomial distribution, Poisson's distribution, exponential distribution, exponential distribution, normal distribution.

UNIT-II

Traffic Studies, Measurement and Analysis; Volume studies, speed studies, travel forecasting principles and techniques, design hourly volumes and speed, origin and destination studies, presentation of data and analysis, t e s t i n g of hypothesis relating to improvements.

UNIT-III

Travel Time am id Delay Studies; Various uses, travel time and delay studies, various methods, data collection and analysis, density studies and headways, gap acceptance studies, intersection delay studies, traffic flow theory, queuing theory and simulation models.

UNIT-IV

Capacity Analysis of Traffic Facilities; Un interrupted facilities, interrupted facilities, Level of Service, quality of service as per HCM, factor saffecting LOS, computation of capacity and LOS, Measure of effectiveness, high way capacity and performance characteristics, intersection design.

UNIT-V

Traffic Control, Design and Regulation; Traffic signals, types, principles of phasing, tune diagram, signalized inter section, saturation flow, saturation head way, capacity of lane group, concept of critical lane group, signal timing, phase plan, phase diagram, splitting of phase, clearance interval, pedestrian requirement, guide lines for protected movements, signal co-ordination, emerging themes, inter-modalism, access management, congestion management, environmental impact assessment.

Suggested Reading

1. Introduction to Traffic Engineering, R SrinivasaKumar, Universities Press, 2018.
2. Highway Capacity Manual, Transportation Research Board, National Research Council, Washington, D.C., 2010.
3. Daganzo, C.R, Fundamentals of Transportation and Traffic Operations, Pergamon, Elsevier Science Inc., NewYork, 1997.
4. Salter, R.J., TrafficEngineering: WorkedExamples, Macmillan, London, 1989.
5. Pignataro,L.J.,TrafficEngineering:TheoryandPractice,PrenticeHall,Englewoodlifts, 1973.
6. Wohl,M. and Martin,B.V,Traffic System Analysis for Engineers and Planners, Mc Graw Hill, NewYork,1983.
7. Drew, D.R., TrafficFlowTheory, Mc Graw Hill, NewYork, 1964.

I Year-I Semester	22PTR03	L	T	P	C
		3	0	0	3

Bridge Engineering

UNIT-I

MasonryarchBridgedesigndetails-Rise,radius,and thicknessofarch-Archring-Dimensioningofsub structures- Abutmentspierandendconnections. (Ref:IRC-SP-13)

UNIT-II

Super Structure: Slab bridge- Wheel load on slab- effective width method- slabs supported on two edges- cantilever slabs- dispersion length- Design of interior panel of slab- Pigeaud's method- design of longitudinal girders- Guyon-Messonet method- Hendry Jaegar method- Courbon's theory. (Ref: IRC-21), voided slabs, T- Beam bridges.

UNIT-III

Plategirderbridges-Elementsofplategirderandtheirdesign-web-flange-intermediatestiffener-verticalstiffeners- bearingstiffener-design problem

UNIT-IV

Compositebridges-Compositeaction-shearconnectors-compositeortransformedsection-designproblem.(Ref:IRC:Section-VI)

UNIT-V

Substructure-Abutments-Stabilityanalysisofabutments-piers-loadsonpiers–Analysisofpiers-Designproblem(Ref:IRC-13,IRC-21,IRC-78)-Pipeculvert-Flowpattern inpipeculvers-culvertalignment-culvertentrancestructure-Hydraulicdesignandstructuraldesignofpipe culverts-reinforcementsinpipes.(Ref:IRC:SP-13)

REFERENCES:

1. Designofconcretebridges-Aswini,Vazirani,Ratwani
2. Essentialsofbridge engineering-JhonsonVictorDDesignofbridges- KrishnaRaju

I Year-I Semester	22PTR04	L	T	P	C
		3	0	0	3

Project Management

UNIT-I

Introduction to Project Management: A systems Approach, Systems Theory and Concepts, Organisation, Management Functions, Overview of Management Objectives, Tools and Techniques, Project Management – Processes and Organisational Structures – Team Management – Project Manager as a Team Leader – Leadership Qualities, PMIS.

UNIT-II

Construction Cost and Value Engineering: Types of Estimates, Implementation of Cost Controls, Project Cost Forecasting, Cost Optimization and Resources Planning-Value Engineering, Techniques for ProjectSelection,Break-EvenAnalysis,CostModelling,EnergyModelling,LifeCycleCostApproach.

UNIT-III

Contract Management Safety in Construction Industry: Tendering and Contracting, Laws of Contracts, sub contracts, Potential Problems, Post Contract Problems, Documents, Conditions, Arbitration, Special Features of International Contracts. Quality Management and Safety in Construction Industry-Quality control by statistical methods, sampling plan, control charts, ISO14000, Safety Measures, Safety Programmed, Safety Awareness and Implementation of Safety Plan– Compensation.

UNIT-IV

Project Scheduling and Analysis Methods: CPM, PERT, Linear programming, queuing concept, simulation, bidding models, game theory.

UNIT-V

Human Resource Management and Construction Management Practices: Man Power Planning – Training – Motivation – Industrial Relations – Welfare Measures – MIS – Components and Structure – Personal Management. Resource Management and Inventory - Basic concepts, labour requirements & productivity, non-productive activities, site productivity, equipment and material management, inventory control. Construction Management Practices - Implementation of Procedures and Practices – International Experiences– Case Studies – Examples.

REFERENCES:

1. Her old Kerzner -Project Management-AsystemsapproachtoPlanning,Scheduling andcontrolling.CBSPublishersandDistributors.
2.K. WakerATeraihandJoseM.Grevarn;FundamentalsofConstructionManagement andOrganisations.
3. AnghelPatterson -ConstructionCostEngineeringHandbook -MarcelDekken Inc.
4. DellIsola- ValueEngineering inConstructionIndustry,VanNostrandReinhold Co.,
5. Choudhary,S.ProjectManagement,Tata McGrawHillPublishingCo.,Ltd.,
6. RainaUK,ConstructionmanagementPractices,Tata McGrawhillPublishingCompanyLtd.
7. Sen gupta Band GuhaH,Construction Management and Planning, Tata McGraw-Hill Publishing Company Limited, New Delhi.

I Year-I Semester	22PTR05	L	T	P	C
		3	0	0	3

Ground Improvement Technique

UNIT- I

Introduction–Need for Engineering Ground–Classifications of Ground Modification Techniques–Suitability, Feasibility and Desirability. Densification of cohesionlesssoils–deep Compaction –Vibroflobation –VibroComposermethodBlasting–DensificationatGround.-Vibrocompaction-HeavyTamping, Stability of foundation trenches and surroundin structures trough's oil Nailing.

UNIT-II

Stabilisation- Mechanical Stabilisation, Lime Stabilisation, Cement Stabilisation,BitumenStabilisation,ThermalStabilisation andChemicalStabilisation.

UNIT:-III

DewateringandGrouting:-Dewateringmethods–opensumpsandditches–gravityflowwells–Vacuumdewatering– Electro– kineticdewatering–electrosmosis -Overviewofgrouting-Suspensiongrouts–Solutiongrouts–Methodsofgrouting–Groutingapplications–Dams,Tunnels,Shafts and drifts,excavations.

UNIT-IV

ImprovementofCohesivesoils– PreloadingSoilReplacement–Radial Consolidation –Vertical andRadialConsolidation - Vertical Drains–SandDrains–EffectofSmear–Sandwicks–Band drains–DynamicCompaction.

UNIT-V

StoneColumns–MethodsofinstallationofStoneColumns–Loadsharedbystonecolumnsandthestabilizedground–usesofstonecolumnsLimecolumnsandgranulartrenches–Installation–ImprovementsexpectedonSoilbehavior.Insitugroundreinforcement–groundanchors–types–Componentsandapplications– upliftcapability.

REFERENCE:

1. ConstructionandGeotechnicalMethodsinFoundationEngineeringByR.M.Koerner,McGraw–HillBook Co.
2. CurrentPracticesinGeotechnicalEngineeringVol.1,AlamSinghandJoshi,InternationalBookTraders,Delhi,&Geo-Environ Academia.

3. Foundation AnalysisandDesign(1VEd.)ByJ.E.Bowles,McGraw–HillBookCo.,
4. GroundImprovementTechniquesbyP.PurushothamRaj,LaxmiPublications(P)Ltd., NewDelhi.
5. Ground Improvement–EditedbyM.P. Moseley,BlackieAcademic&Professional.
6. SoilMechanicsfor RoadEngineers,H.M.S.O,Londan.
7. Ground ImprovementTechniquesbyBergadoetal.

I Year-I Semester	22PTR06	L	T	P	C
		3	0	0	3

GIS for Transportation

UNIT-I

Introduction to GIS: Introduction, GIS overview, use of GI Sindecision making, Data processing, Components of GIS, The GIS and the organization.

UNIT-II

Data Input and Output: Data input-Key board entry, Remote eland sensed data, existing digital data, censusre lated datasets, Data output - Hardcopyandsoft,copydevices.

UNIT-III

DataQualityandDataManagement:Componentsofdataquality-Microlevel,Macrolevelcomponents,Sourcesoferror,Anoteaboutdataaccuracy.Thedatabaseapproach, 3classicdatamodels,Natureof geographic data,Spatialdatamodels,DatabasesforGIS.

UNIT-IV

GISAnalysis,FunctionsandImplementation:Organizinggeographicdataforanalysis,Maintenanceandanalysisofthespatial dataandnon-spatialattributedataanditsintegrationoutputformatting.Awareness,developingsystemrequirements,Evaluationofalternativesystems,SystemjustificationandDevelopmentofanimplementationplan, Systemacquisitionandstart up,Operationofthesystem.

UNIT-V

ApplicationofGISinTransportationEngineering: Intelligentinformationsystemforroadaccessibilitystudy,GISdatabasedesignforphysicalfacilityplanning,Decisionsupportsystemsforlanduseplanning.GISapplicationsin environmentimpactassessment,GISbasedHighwayalignment,GISbasedroadnetworkplanning,GISbasedtrafficcongestionanalysisand accidentinvestigation.

REFERENCES:

GISAManagement,PerspenfiStanAronoff,WDLPublisher.

I Year-I Semester	22PTR07	L	T	P	C
		3	0	0	3

Pavement Management System

UNIT-I

Introduction: Definition-ComponentsofPavementManagementSystems,Essentialfeatures.PavementManagementLevelsand functions:IdealPMS-NetworkandProjectlevelsofPMS-InfluenceLevels-PMS Functions- Function of Pavement evaluation

UNIT-II

PavementPerformance:ServiceabilityConcepts-roughness-RoughnessComponents-Equipment-IRI-modelingtechniques,structuralconditiondeteriorationmodels,mechanisticandempiricalmodels,HDM andothermodels,comparison ofdifferentdeteriorationmodels.

UNIT-III

PavementEvaluation:

FunctionalEvaluation: Functional andStructural deteriorationmodels,unevennesspredictionmodelsandothermodels,comparison.Casestudies.Equipments

Structural Evaluation: -Basics-NDT andAnalysis—ConditionSurveys-Distress-DestructiveStructuralAnalysis- Applicationin NetworkandProjectLevels

UNIT-IV

DesignAlternatives,RehabilitationandMaintenance:Designobjectivesandconstraints,basic structuralresponse models,physicaldesigninputs,alternatepavementdesign strategiesandeconomicevaluation,lifecyclecosting,analysisofalternatepavementstrategiesbased ondistressandperformance,casestudies.
Equipments.Identification of Alternatives-Deterioration Modeling-PriorityProgrammingMethods.

UNIT-V

ExpertSystemsandPavementManagement:Roleofcomputersinpavementmanagement,applications ofexpertsystemsformanagingpavements,expertsystemforpavementevaluationandrehabilitation,knowledge-basedexpertsystems,casestudies.

TEXTBOOKS:

1. Ralph Haasand Ronald W.Hudson,'Pavement Management System',Mc GrawHillBookCo. 1978

2. Ralph Haas, Ronald Hudson Zanieswki.'Modern Pavement Management, Kreiger Publications.

3. Proceedings of North American Conference on Managing Pavement.

4. Proceedings of International Conference on Structural Design of Asphalt Pavements NCHRP, TRR and TRB Special Reports

I Year-I Semester	22PTR08	L	T	P	C
		3	0	0	3

Transportation Modelling and Simulation

UNIT-1

Introduction of Modeling: Fundamentals of system approach. System modeling, Model structure, Variables, controllable variables, uncontrollable variables, parameters, co efficient and other statistical methods for testing of model sand data.

UNIT-II

ClassificationofModels;Classificationofmodels-Linearmodels,Non-linearmodels,Time-invariantmodels,Time-variantmodels,State-spacemodels,Distributed.parametermodels.SystemSynthesis--DirectandInverseProblems,RoleofoptimizationandExamplesfromtransportationengineering.

UNIT-III

PreliminaryDataProcessing:datacollection,RegressionAnalysis-Linearmultipleregressionanalysis;Analysisofresidues,Testsofgoodnessoffit.SpatialDistribution-Polynomialsurfaces,Splinefunctions,Cluster.analysisandNumericalproductionofcontourmaps.TimeSeriesAnalysis-Auto-cross.correlationanalysis,Identificationoftrend,spectral analysis,Identificationofdominantcycles,smootheningtechniques, Filtersand forecasting.

UNIT-IV

ModelBuilding: ChoiceofModelStructure-Aprioriconsiderations,Selectionbaseduponpreliminarydataanalysis,Comparingmodelstructures.ModelCalibration-Roleofhistoricaldata,DirectandIndirectmethodsofsolvinginverseproblem. -Model Validation.

UNIT-V

Simulation;Randomvariables,Basicconcepts.Probabilitydensityanddistributionfunctions,Expectationandstandarddeviationofdiscreteandcontinuousrandomvariablesandtheirfunctions,Covarianceandcorrelation,commonlyusedtheoreticalProbabilitydistributions:Uniform,Normal,Binomial,Poisson,Negativeexponential.Fittingdistributionstorawdata:Chi-squareandKolmogrov-Smirnov'stestsofthegoodnessoffit.Centrallimittheorem,variousalgorithmsforgenerationofRandomnumbers.Queuingtheory:Elements,Deterministicqueues.ApplicationsofMonte,Carlosimulation:"Basicconcepts.Generation-ofsyntheticobservations,-Statisticalinterpretationoftheoutput,Evaluationofdefiniteintegralsandexamples.

References

1. Bratley,P., FoxB.L., Schrage,L.E.B.,Guideto Simulation,Springer-Verlag,New York1983.
2. Leigh,J.R.,Modelingand Simulation,PeterPeregrinus,London,1983.
3. Bernard,Z.,TheoryofModelingandSimulation,John-Wiley,NewYork,1976.
4. Ortuzar,J.andWillumsen,L.G,ModelingTransport,Wiley,Chinchestor,1994.
5. Hansher,D.A.,andButton.K.J.,HandbookofTransportModeling,Pergamon,Oxford,UK,2000

I Year-I Semester	22PTR09	L	T	P	C
		0	0	0	2

Research Methodology and IPR

Unit 1: Meaning of research problem, Sources of research problem, Criteria Characteristics ofa good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection,analysis, interpretation

Unit 2: Effective literature studies approaches, analysis Plagiarism, and Research ethics. Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of researchproposal, a presentation and assessment by a review committee

Unit 3: 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 grantsof patents, Patenting under PCT.

Unit 4: Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patentinformation and databases. Geographical Indications.

Unit 5: New Developments in IPR: New developments in IPR; IPR of Biological Systems,Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Text Books:

- Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science& engineering students‟"
- Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
- Ranjit Kumar, 2nd Edition , "Research Methodology: A Step by Step Guide for beginners"

Reference Books:

1. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
2. Mayall , "Industrial Design", McGraw Hill, 1992.
3. Niebel , "Product Design", McGraw Hill, 1974.
4. Asimov , "Introduction to Design", Prentice Hall, 1962.
5. Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", 2016.
6. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

Course Outcomes:

At the end of this course, students will be able to

- Understand research problem formulation.
- Analyze research related information
- Follow research ethics
- Understand that today‟s world is controlled by Computer, Information Technology, buttomorrow world will be ruled by ideas, concept, and creativity.
- Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right tobe promoted among students in general & engineering in particular.
- Understand that IPR protection provides an incentive to inventors for further research workand investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

I Year-I Semester	22PTR10	L	T	P	C
		0	0	4	2

Highway Aggregates Lab

1. Aggregatetests.
2. Testsonsubgradesoils.
3. Soilstabilizationtests.
4. CaliforniaBearingRatioTest
5. SoilClassification&Grainsizeanalysis.
6. Mini projectbasedonfield andlaboratorystudiesanddatacollected.

Note: Alltests asperIS,ASTM,AASHTO,TRL,IRC procedures/specificationsandguidelines

I Year-I Semester	22PTR11	L	T	P	C
		0	0	4	2

Bituminous Testing Lab

1. BitumenandTarTests asperIScodeprovisions.
2. Benkelmanbeam test
3. StonePolishingValuetest
4. InternationalRoughness Index test
5. Mix design forBituminousmixes
6. FallingWeightDeflectometer.
7. Miniprojectbasedonfieldandlaboratorystudiesanddatacollected.

Note: Alltests asperIS,ASTM,AASHTO, TRL,IRC procedures/specificationsandguidelines

I Year-II Semester	22PTR13	L	T	P	C
		3	0	0	3

Pavement Analysis and Design

UNIT-I

PavementTypes,WheelLoadsandDesignFactorsDefinitionofPavementTypes,ComparisonofHighwaypavements,WheelLoads,Tyrepressure,Contactpressure,DesignFactors:Traffic and Loading,Environment,Materials,Failurecriteria,Reliability.

UNIT-II

Stressesin Pavements

LayeredSystemConcepts:OneLayerSystem:BoussinesqTheory.TwoLayerTheory:Burmister'sTheory.ThreeLayerSystem.StressesinRigidPavements.RelativeStiffnessofSlabs,ModulusofSubgradeReaction,StressesduetoWarping,Stressesdueto Friction,Stresses duetoLoad,IRCRecommendations.

UNIT-III

PavementDesign

IRCMethodofFlexiblePavementDesign,AASHTOMethodofFlexiblePavementDesign,IRCMethod for RigidPavements,useofGeosynthatics in pavements.

UNIT-IV

Pavement Inventories

Serviceability Concepts, Visual Rating, Pavement Serviceability Index, Roughness Measurements,
using Ben klemanBeam Deflection Method, Load Rebound Deflection Skid Resistance Measurement.

UNIT-V

PavementEvaluation

FunctionalPavementPerformance
Evaluation:AASHTOMethod,PsychoPhysicalandPsychoMetricScalingTechniques,DeductValueMethod.
BeamDeflectionMethod,PavementDistressRatingTechnique.DesignofOverlaysbyBenkelmenBeamDeflectionMethodsasperIRC–81-1997– pavementsonproblematicsoils.

REFERENCES:

1. YoderandWitzorack,"Principles ofPavementDesign",JohnWilleyand Sons.
2. Yang,H. Huang, "PavementAnalysisandDesign", PrenticeHallPublication,EnglewoodCliffs,New Jersy.
3. Sargious,M.A. PavementsandSurfacings forHighwaysandAirports –AppliedsciencePublisherslimited
4. RalpsHassandHudson,W.R."PavementManagementSystem"Mc-GrawHillBookCompany.
5. IRCcodesofpractice.

I Year-II Semester	22PTR14	L	T	P	C
		3	0	0	3

Transportation Planning

UNIT-I

UrbanTransportationProblemTravelDemand:UrbanIssues,TravelCharacteristics,EvolutionofPlanningProcess,SupplyandDemand–Systemsapproach.TravelDemand:Trends,OverallPlanningprocess,LongtermVsShorttermplanning,DemandFunction,IndependentVariables,TravelAttributes,AssumptionsinDemandEstimation,Sequential,andSimultaneousApproaches,AggregateandDisaggregateTechniques.

UNIT-II

DataCollectionAndInventories:Collectionofdata–OrganisationofsurveysandAnalysis,StudyArea,Zoning,TypesandSourcesofData,RoadSideInterviews,HomeInterviewSurveys,CommercialVehicleSurveys,SamplingTechniques,ExpansionFactors,AccuracyChecks,UseofSecondarySources,Economicdata–Income–Population–Employment–VehicleOwnerShip.

UNIT-III

FourStageDemandForecasting:UTPSApproach,TripGenerationAnalysis:ZonalModels,CategoryAnalysis,HouseholdModels,TripAttractionmodels,CommercialTripRates.TripDistribution:GrowthFactorMethods,GravityModels,OpportunityModels,TimeFunctionIterationModels.

UNIT-IV

ModeChoiceandTrafficAssignment:ModeChoiceBehaviour,CompetingModes,ModeSplitCurves,ModelsandProbabilisticApproaches.TrafficAssignment:BasicElementsofTransportNetworks,Coding,RouteProperties,PathBuildingCriteria,SkimmingTree,All-or-NothingAssignment,CapacityRestraintTechniques,ReallocationofAssignedVolumes,EquilibriumAssignment,DiversionCurves.

UNIT-V

PlanPreparationAndEvaluation:TravelForecaststoEvaluateAlternativeImprovements,ImpactsofNewDevelopmentonTransportationFacilities.Masterplans,SelectionofCorridor,CorridorIdentification,CorridordeficiencyAnalysis.

REFERENCES:

1. IntroductiontoTransportationPlanning –M.J.Bruton;Hutchinsonof LondonLtd.
2. IntroductiontoUrbanSystemPlanning -B.G.Hutchinson;McGrawHill.
3. TrafficEngineeringandTransportPlanning -KadiyaliL.R., KhannaPublishers
4. Lecturenotes onUTP-Prof.S.Raghavachari,R.E.C.Warangal.

I Year-II Semester	22PTR15	L	T	P	C
		3	0	0	3

Pavement Construction

UNIT-I

PAVEMENTCONSTRUCTION:PreparationandConstructionofSubgradeSoil,SubbaseCourses,BaseCourses,BituminousSurfaceCourses,andCementConcreteSurfaceCourses;MORTHspecifications,Qualitycontrol..

UNIT-II

PAVEMENTINVENTORIESANDEVALUATION:FactorsaffectingPavementDeterioration;FunctionalConditionEvaluationTechniques:RoughnessMeasurements,IdentificationofUniformSections,ServiceabilityConcepts:Visual&RideRatingTechniques,IntroductiontoPsychometricandPsychophysicalScalingTechniques:Hutchinson'sTrackingTaskDeviceStructuralConditionEvaluationTechniques:NDTProcedures,ReboundDeflection,DeflectionBowlMeasurementandAnalysis,DestructiveTesting:RemainingLifeConcept,Asphaltic Institute's EquivalencyFactors

UNIT-III

EVALUATIONOFPAVEMENTSAFETY:ImportanceofSkidResistance,FactorsAffectingSkidResistance,SkidResistanceStudies,HydroplaningReductionwithPorousOverlays&PopcornFrictionOverlays;DeteriorationModellingConcepts:FactorsInfluencingStructural &FunctionalConditionDeterioration,ExamplesofInitiationandProgressingDeteriorationModels,UseofDeteriorationModelsbyHDMSoftware

UNIT-IV

PAVEMENTMAINTENANCE&QUALITYCONTROL:Routine,ResponsiveMaintenanceProgrammes, PeriodicMaintenance,SpecialRepairs,RehabilitationandReconstruction,Objectives&ComponentsofPavementMaintenanceManagementSystem(PMMS),StagesinImplementingPMMS,TotalQuality Management(TQM):QualityAssurance/QualityControlConcepts,Sampling,TolerancesandControls RelatedtoProfile&Compaction,RoleofISO9000inTOM.

UNIT-V

PAVEMENTMANAGEMENTSYSTEM(PMS):PhasesandComponentsofSystem'sApproach,RelationnhipBetweenSystemApproachand PMS, ComponentsandActivitiesofPMS,Inter-relationshipsbetweenthedifferentcomponentsofPMS,Steps inImplementingPMS,PavementInvestmentPlanningApproaches:IndexRanking,BenefitMaximization&Cost

MinimizationMethods,EvaluatingAlternativeStrategiesandDecisionCriteriaUsingHDMPackage.

REFERENCES:

1.RCCHaas,W.Ronald Hudson,etai,ModernPavementManagement,KriegerPublishing Company

2.ISTE SummerSchoolReportonPMSSbyBangaloreUniversity,ISTE, NewDelhi.

3. Mohammed Y.Shahin,PavementManagementforAirports,Roads&ParkingLots, Chapman&HallPublishers

4. Instructor'sGuide-AsphaltInstitute,AsphaltTechnologyandConstructionPractices, Educationalseries

5. AFStocks,ConcretePavements,ElsevierAppliedSciencePublishers,NewYork

6. HaroldN.Atkins,HighwayMaterials,Soils &Concrete3rd Edition,PrenticeHall

MORTH,GOI, "SpecificationsforRoads&BridgeWorks",NewDelhi

I Year-II Semester	22PTR16	L	T	P	C
		3	0	0	3

Environmental Impact Assessment

UNIT-I

Introduction:Environmentanditsinteractionwithhumanactivities– Environmentalimbalances¬Attributes,Impacts,'IndicatorsandMeasurements-ConceptofEnvironmentalImpactAssessment(EIA), EnvironmentalImpactStatement,ObjectivesofEIA,AdvantagesandLimitations

UNIT-II

EnvironmentalIndicators-Indicatorsforclimate-Indicatorsforterrestrialsubsystems-Indicatorsforaquatic subsystems-Selectionofindicators-Socia-economicindicators-Basicinformation-Indicatorsforeconomy-Socialindicators-Indicatorsforhealthandnutrition-Cultural indicators-Selectionofindicators.

UNIT-III

Environmentalissuesinwaterresourcedevelopment-Landuse-SoilerosionC1ndtheirshortandlongtermeffects-Disturbanceandlongtermimpacts-Changesin quantityandqualityofflow¬Sedimentation– Environmentalimpactassessmentofwaterresourcedevelopmentstructures– Gasestudies,WaterQualityImpactAssessment-Attributes,WaterQuality,ImpactAssessmentofWater.ResourcesProjects,DataRequirementsofWater QualityImpactAssessmentforDams,ImpactsofDams onEnvironment,CaseStudies.

UNIT-IV

EnvironmentalIssuesinIndustrialDevelopment:On-siteandOff-siteimpactsduringvariousstagesofindustrialdevelopment,Longtermclimaticchanges,Greenhouseeffect,Industrialeffluentsandtheirimpactonnaturalcycle,EnvironmentalimpactofHighways,Mining'anddEnergydevelopment

UNIT-V

MethodologiesforCarryingEnvironmentalImpactAssessment:OverviewofMethodologies.Adhoc,Checklist,Matrix,Network,Overlays,BenefitCost Analysis,ChoosingAMethodology,ReviewCriteria.

REFERENCES:

1. Jain,R.K.,Urban,L.V.,Stracy,G.S.,(1991),"EnvironmentalImpactAnalysis",Van NostrandReinholdCo.,New York
2. Rau,J.G.andWooten,D.C.,(1996),"EnvironmentalImpactAssessment",McGrawHillPub.Co.,New York
3. UNESCO,(1987),"MethodologicalGuidelines forthe IntegratedEnvironmentalEvaluationofWaterResourcesDevelopment",UNESCO/UNEP ,Paris
4. Canter,L.W.,(1997),"EnvironmentalImpactAssessment",McGrawHillPub.Co.,NewYork.

I Year-II Semester	22PTR17	L	T	P	C
		3	0	0	3

Traffic Flow Analysis

UNIT-I

TrafficFlowDescription:TrafficStreamCharacteristicsandDescriptionUsingDistributions:Measurement,MicroscopicandMacroscopicStudyofTrafficStreamCharacteristics-Flow,SpeedandConcentration;UseofCounting,IntervalandTranslatedDistributionsforDescribingVehicleArrivals,Headways,Speeds,GapsandLags;FittingofDistributions,GoodnessofFitTests.

UNIT-II

TrafficStreamModels:FundamentalEquationofTrafficFlow,Speed-Flow-ConcentrationRelationships,NormalisedRelationship,FluidFlowAnalogyApproach,ShockWaveTheory-Flow-DensitydiagramuseinShockwaveanalysis;UseofTime-spacediagramforshockwavedescription;Bottlenecksituationsandshockwaves;trafficsignalandshockwavetheory;numericalExamplesforapplicationofshockwavetheory;,PlatoonDiffusionandBoltzmanLikeBehaviourofTrafficFlow,Car-FollowingTheory,LinearandNon-LinearCar-FollowingModels,AccelerationNoise,Fuelconsumptionmodels

UNIT-III

QueuingAnalysis:FundamentalsofQueuingTheory,DemandServiceCharacteristics,DeterministicQueuingModels,StochasticQueuingModels,MultipleServiceChannels,AnalysisofM/M/1system;AssumptionsandDerivationofSystemStateEquations;ApplicationofM/M/1analysisforparkingGaragesandTollPlazas-numericalExamples;AnalysisofD/D/1systemfordelaycharacteristics;TrafficSignalanalysisasD/D/1system;Computationofdelays andqueue dissipationTime–NumericalExamples.

UNIT-IV

PedestrianDelaysandGaps:PedestrianGapacceptanceanddelays;ConceptofBlocks,Anti-blocks,GapsandNon-Gaps;Underwood'sanalysisforPedestrianDelays;WarrantsforPedestrianCrossingFacilities–MinimumVehicularVolumeWarrant,MinimumPedestrianVolumeWarrant,MaximumPedestrianVolumeWarrant.

UNIT-V

SimulationModels:PhilosophyofSimulationModelling,FormulationofSimulationModel,MethodologyofSystemSimulation,SimulationLanguages,GenerationofRandomNumbers,

GenerationofInputs–
VehicleArrivals,VehicleCharacteristics,RoadGeometrics,DesignofComputerSimulationExperiments,AnalysisofSimulationData,FormulationofSimulationProblemsinTrafficEngineeringandValidation.;Basicconceptsofsimulationmodellingapplicationfor Signalised Intersections,Pedestrian CrossingsandTransitscheduling.

REFERENCES:

1. Traffic FlowTheory:AMonograph, TRB SpecialReport165
2. Fundamentals of Transportation Engineering–C.S.Papacostas,PrenticeHall IndiaPublication
3. PrinciplesofHighwayEngineeringandTrafficAnalysis–F.L.Mannering&W.P.Kilareski,John WileyPublishers.
4. Traffic FlowFundamentals–A.D.May,, PrenticeHallIndiaPublication

Year-II Semester	22PTR18	L	T	P	C
		3	0	0	3

DESIGN AND MAINTENANCE OF RURAL ROADS

UNIT-I

Introduction:ImportanceofRuralroads,Classificationofruralroads,Terrainclassification, Socio-economic impact of ruralroads.

Planning andAlignment:Databasefor masterplan,Conceptofnetworkplanning,RuralRoadsplan,Roadalignment,Governingfactor sforrouteselection,Factorscontrollingalignment,Specialconsiderationswhilealigninghillro ads,Surveys,Detailedprojectreport,Environmental issues

UNIT-II

GeometricDesign:Introduction,Designspeed,Basicprinciplesofgeometricdesign,Elements, Horizontalandverticalalignment,Alignmentcompatibility,Lateralandverticalclearances

RoadMaterials:General,Soilandmaterialsurveys,Soilasroadconstructionmaterial,Stabilize dsoils,Aggregatesforpavementcourses,Newmaterialsandstabilizers,Materialsforbitumino usconstruction,Materialsforsemi-rigidandrigidpavement,Materials forspecial pavements Climatic suitabilityof concretematerials

UNIT-III

PavementDesign:Introduction,Designparameters,Pavementcomponents,Designofflexible pavement,Designofsemi-rigidpavement,Designofrigidpavement,Designofspecialpavements,Drainage andShoulders

SpecificationsandConstruction:General,Selectionofconstructionmaterialsandmethodology ,Earthwork,Sub-base,Basecourse,Bituminousconstructions,Semi-rigidpavementconstruction,Concretepavements,Constructionofspecialpavements,Equipm entrequired for differentoperations.

UNIT-IV

GreenRoadConceptandUseofWasteMaterials:Introduction,Significanceofgreenroads,flya shforroadconstruction,Iron&steelandcopperslags,Lime-ricehuskashconcrete,Recycled concrete aggregate,other waste materials.

UNIT-V

QualityControlinConstruction:General,Pre-requisite,Specificationsandcodesofpractice,Qualitycontroltests duringconstruction.

Maintenance:General,Distresses/defectsinpavements,Definitionsofmaintenanceactivities, Inventoryofroadandinspection,Typesofmaintenance,Classificationofmaintenanceactivitie s,Maintenance norms ofmaintenance cost.

TextBooks

1.HighwayEngineering,S.K.KhannaandC.E.GJustoandA.Veeraragavan,Nemc handBrotherspublications.

ReferenceBooks

1. IRC:SP20-2002,,"Rural RoadsManual"
2. IRC: SP 72-2007,,Guidelines forthe Design ofFlexible Pavements forLow
3. Volume RuralRoads"
4. IRC: SP 62-2004,,Guidelines forthe DesignandConstruction of CementConcrete
5. Pavements forRuralRoads"
6. IRC,,SpecificationsforRuralRoads",MoRD,2004,CRRI,,VariousReportsonUseofWasteM aterials

I Year-II Semester	22PTR19	L	T	P	C
		3	0	0	3

Highway Safety Engineering

UNITI
Introductiontosafety:

Roadaccidents,Trends,causes,Collisiondiagrams;Highwaysafety;Humanfactorsandroaduserlimitations;Speedanditseffectonroadsafety;Vehiclefactors;HighwaysafetyinIndia.Multi-causaldynamicsystemsapproachtosafety;CrashVsAccident;Roadsafetyimprovementstrategies;Elementsofa roadsafetyplan,SafetydataNeeds;Safevehicledesign.

UNITII
StatisticalInterpretationandAnalysisof Crash
Before-aftermethodsincrashanalysis,Recordingofcrashdata;AccidentInvestigation andAnalysis;Statisticaltestingandthe roleofchance;BlackSpotIdentificationand Investigations,CaseStudies.

UNITIII
Road SafetyAudits:

Keyelementsof a roadsafetyaudit,RoadSafetyAudits&Investigations, Workzonesafetyaudit;Crashinvestigationandanalysis,Methods for identifyinghazardousroadlocations,CaseStudies.

UNITIV
CrashReconstruction:

Describethe basicinformationthatcanbe obtainedfromtheroadwaysurface,understandbasicphysicsrelated tocrashreconstruction,speedforvariousskid,friction,drag,andaccelerationscenarios,variablesinvolvedin jumpandflipcrashes,variablesinvolvedinpedestriancrashes,CaseStudies.

UNITV
MitigationMeasures:

Accidentpreventionbybetterplanning,Accidentpreventionbybetterdesignofroads,CrashCountermeasures,Highwayoperationandaccidentcontrolmeasures,HighwaySafetyMeasuresduringconstruction,Highwaygeometryandsafety;Safetyinurbanareas;Publictransportandsafety;Roadsafetypolicymaking,Stakeholdersinvolvement;Roadsafetylaw.

References:

1. AthelstanPopkess,Traffic ControlandRoadAccidentPrevention,Chapmanand Hall, 1997(Digitized2008)
2. EzraHauer, ObservationalBefore-AfterStudies inRoadSafety,PergamonPress,1997 (reprinted2002).
3. GeetamTiwariandDinesh Mohan,TransportPlanningandTraffic Safety: MakingCities,Roads,andVehiclesSafer,CRCPress,2016.
4.Instituteof Transportation Engineers(ITE), TheTrafficSafetyToolbox:APrimeron TrafficSafety,ITE,1999.

I Year-II Semester	22PTR20	L	T	P	C
		3	0	0	3

Intelligent Transportation System

UNIT-I

FundamentalsofITS: DefinitionofITS s,ThehistoricalcontextofITSfrombothpublicpolicyandmarketeconomicperspectives,TypesofITS;H istoricalBackground,BenefitsofITS

UNIT-II

SensortechnologiesandDatarequirementsofITS:ImportanceoftelecommunicationsintheITSsyste m,InformationManagement,TrafficManagementCentres(TMC).ApplicationofsensorstoTrafficman agement;Trafficflowsensortechnologies;TranspondersandCommunicationsystems;Datafusionattra fficmanagementcentres;Sensorplanandspecificationrequirements;ElementsofVehicleLocationand RouteNavigationandGuidanceconcepts;ITSDatacollectiontechniques– Detectors,AutomaticVehicleLocation (AVL),AutomaticVehicleIdentification(AVI),GIS,videodatacollection

UNIT-III

ITSfunctionalareas– AdvancedTrafficManagementsystems(ATMS),AdvancedTravelerInformationsystems(ATIS),Co mmercialVehicleOperations(CVO),AdvancedVehicleControlsystems(AVCS),AdvancedPublicT ransportationsystems(APTS),AdvancedRuralTransportationsystems(ARTS).

ITSUserNeedsandServices– TravelandTrafficmanagement,PublicTransportationManagement,ElectronicPayment,Commerci alVehicleOperations,EmergencyManagement,AdvancedVehiclesafetysystems,InformationMana gement.

UNIT-IV

ITSArchitecture– RegionalandProjectITSarchitecture;ConceptofoperationsITSModelsandEvaluationMethods;Plan ningandhumanfactorissuesforITS,Casestudiesondeploymentplanningandsystemdesignandoperati on;ITSandsafety,ITSandsecurity,ITSasatechnologydeploymentprogram,research,developmentan dbusinessmodels,ITSplanning

UNIT-V

ITSapplications:Trafficandincidentmanagementsystems;ITSandsustainablemobility,traveldema ndmanagement,electronictollcollection,ITSandroad-pricing.;Transportationnetworkoperations;commercialvehicleoperationsandintermodalfreight;pu blictransportationapplications;ITSandregionalstrategictransportationplanning,including

regionalarchitectures:ITSandchangingtransportationinstitutionsAutomatedHighwaySystems-Vehiclesin Platoons–Integration ofAutomatedHighwaySystems.ITSProgramsintheWorld–OverviewofITSimplementationsindevelopedcountries,ITSindevelopingcountries

REFERENCES:

1.FundamentalsofintelligenttransportationsystemsplanningByMashrurA.Chowdhury,AdelWadi dSadek

2.Lawrence A.Klein,SensortechnologiesandDatarequirementsofITS

3. ITSHandBook2000:RecommendationsforWorldRoadAssociation(PIARC)byKanPaulChen,John Miles.
4. Sussman,J.M.,Perspectiveon ITS,ArtechHousePublishers,2005.
5. National ITSArchitectureDocumentation,USDepartmentofTransportation,2007

I Year-II Semester	22PTR21	L	T	P	C
		0	0	4	2

Advanced Transportation Engineering Lab

1. VolumeStudies–StraightRoadsandatIntersections

2. Speed Studies- SpotSpeedStudiesbyStop Watch,EnosocpeandRadarSpeedMeter3.JourneyTimeandDelayStudies-FloatingCar Method

4. ParkingSurveysandParkingTurnoverStudies

5. StudyofGapsandLags–CriticalGapsandLagsatersections

6.Delay MeasurementatSignalisedandUnsignalisedIntersections

7. Traffic DiversionAnalysis usingdiversioncurves.8.VideographySurvey.

9.RoadsafetyAudit.

10. MiniProjectbasedonabovestudies.

I Year-II Semester	22PTR22	L	T	P	C
		0	0	4	2

Transportation Simulation Lab

1. DrivertestingExperiments
2. Intersectiondesigns
3. SignalDesign.
4. OriginandDestinationStudies
5. ComputerSoftware:PrinciplesofTRIPS,CUBE,DemoVersions,Casestudies.
6. TrafficSimulationstudiesusingVISSIM.
7. Cellular applications.
8. AccidentStudies.

II Year - I Semester	22PTR25	L	T	P	C
		3	0	0	3

Elective-V a) Economics of Infrastructure & Transportation projects

UNIT – I

Transportation Projects Formulation and Development: Requirements in project formulation. Components of project, Non- monetary and monetary Criteria in formulation of project. Decision making Criteria input in Project formulation. Preparation of DPR – Guidelines Transport Projects and development: preparation of Project, Highway Planning,
Traffic infrastructure, Project formulation, Road Network project development

UNIT- II .

Economic evaluation of Transportation plans: Need for Economic Evaluation; Principles of economic evaluation; Welfare economics; Social costs, Vest change, Rate of return. Value of Travel time Savings; Economic concept of evaluation of travel time savings, Issues connected with evaluation of travel time savings. Vehicle operating costs; Components ofVOC, Road user Cost study in India; Accident costs; Methodologies for economic evaluation of an accident; Factors involved.

UNIT-III

Methods of Economic Analysis: Cash flow diagrams, Time value of money, Inflation, Interest, Depreciation, Cost and benefit components, discounting criteria. Equivalent Uniform Annual cost Method; Present worth of cost method; Equivalent uniform annual net return method; Net-present value method; Benefit cost ratio method; Rate of Return Method; Application of these methods to numerical examples.

UNIT-IV Analysis of variable costs and Transportation Asset Management: Types of Capital

Financing; valuation; Project appraisal by shadow pricing with case studies. Economic Analysis of BOT and BOOT projects and allocations. Introduction and scope of asset management in India.

UNIT-V

Environmental Impact Assessment: Basic concepts, Objectives, Transportation related
Environmental Impacts - Vehicular Impacts - Safety and Capacity Impacts - Roadway Impacts – Construction Impacts, Environmental Impact Assessment-Environmental Impact Statement, Environment Audit, Typical case studies.

References

1. Transportation Engineering Economics - Heggie. I.G., McGraw Hill Publishers.
2. Economic Analysis for Highways - Winfrey. R; International Text Book Company.
3. Traffic Engineering and Transport Planning - L. R. Kadiyali, Khanna Publishers.
4. Road User Cost Study, CRRI.
5. Road Project Appraisal for Developing Countries, J. W. Dickey, John Wiley & Sons.
6. Construction Management & Planning, B.Sengupta, H.Guha, Tata McGraw Hill, New Del

II Year - I Semester	22PTR26	L	T	P	C
		3	0	0	3
Elective-V b) **Airport Engineering**					

UNIT-I

Airport Planning: Growth of Air Transport, Technological Developments, Institutional Development for Planning, Regulatory Practices; Aircraft characteristics related to airport planning and design, Future trends in Air craft design and Airport Planning; Airport master plan, site selection, planning surveys etc. Airport Obstructions: Zoning Laws, Classification, Approach and Turning Zones.

UNIT-II

Runway Design and Airport Capacity: Runway Orientation, Basic Runway Length and Factors affecting, Correction for elevation, temperature and gradient as per ICAO and FAA, Run way Geometric Design. Airport Capacity: Classification and Standards; Capacity of Airport, Runway, Taxiway and Gate; Delays; Configuration of Airport and Configuration; Runway Intersection Design; Terminal Facilities and Standards: Planning Concepts. Taxiway Design: Factors affecting Taxiway Design, Geometric Design as per ICAO, Exit taxiways, Fillets, Separation clearance, Holding Apron, Turn Around.

UNIT-III

Design of Airport Pavements: Design factors, Calculation of ESWL with different wheel load configurations and methods, Repetition of loads, failure criteria; Flexible Pavements Design: US corps of Engineers Method, FAA method; Rigid Pavement Design methods: US corps of Engineers method, PCA Method, FAA method, LCN Method and CAN-PCN System.; Overlays; Drainage: Surface and subsurface methods, filter materials, Special characteristics and requirements of Airport Drainage. Airfield Pavement Maintenance and Rehabilitation: Need, Failures, Evaluation of flexible and Rigid Pavements, Strengthening of Airfield Pavements and maintenance operations.

UNIT-IV

Air Travel Demand Analysis: The Demand Analysis, Microanalysis of Air Travel Demand, Calibration of Macro analysis of Air Travel Demand, Disaggregate Models Route

Frequency planning. Air travel choice Models, Simultaneous Models of Demand and supply. Optimal Route Frequency Planning.

UNIT-V

Air Traffic Controls (ATC): Visual Aids: marking and lighting; Need, Network and Aids for ATC, Radio equipment; Design of Heliports and STOLPORTS: Design Factors, Planning, Site selection. Geometric Designs, Visual Aids.

References

1.Principles of Pavement Design, Yoder E.J. and Witczak M. W.John Wiley &-Sons, 1975.

2.Elementary Hand Book of Aircraft Engines, A. W. Judge,Chapman and Hall ltd, London.

3.Airplanes Structures, A.S. Nil.es and J.S. Newell, M. W. JohnWiley& Sons, New York.

4.Transportation Engineering- Airports, Railways, Docks &Harbours, R, Srinivasa Kumar, Universities Press, 2014.

5.Air Port Engineering, Norman Ashford and Paul H Wright, M.W.JohnWHey& Sons.

II Year - I Semester	22PTR27	L	T	P	C
		3	0	0	3
Elective-V **Transportation System Management**					

UNIT-I

TRAFFIC REGUALTIONS: Purpose and Scope, One way streets; reversible lanes and road ways; Turn regulations, Transit and Carpool lanes, Bicycle lanes and Bikeways, Pedestrian only streets, Speed Regulations, Passing and No Passing Regulations; Stop and yield controls.

UNIT-II

TRAFFIC MANAGEMENT: Need for Traffic Management, Basic Traffic Management Activities, Traffic Management Strategies and their Co-ordination; Access Management, Congestion Management, Traffic Calming, Evaluation of Traffic Management Systems.

UNIT-III

TRANSPORTATION SYSTEM MANAGEMENT: Objectives, Need for TSM Long – Range vs.

TSM Planning; TSM Actions, Traffic Management Techniques for improving Vehicular Flows, Preferential Treatment for High Occupancy Modes; Promoting Non- Auto and High Occupancy Vehicles; Transit and Intermediate public Transport service improvements, Demand Management Techniques for Reduced Intermediate Public Transport service improvements, Demand Management Techniques for Reduced Traffic Demand, Staggered Working Hours, Vehicular Restrictions, Intersection management techniques- Signal Progression – Optimization.

UNIT-IV

LOCALAREATRAFFICMANAGEMENT: Pedestrian Facilities; Bicycle Facilities; Traffic Planning and Management at Local Level; Individual Sites, Residential Neighbor hoods and local interests, Traffic Effects of Land Use Developments.

UNIT-V

TRAFFIC ADMINISTRATION: Legislative Authority; Functional Responsibilities; OrganizationUMTA-State Highway Department; Traffic Records; Research Bodies; Citizen Participation; Asset Management.

REFERENCES:

1.Institution of Transportation Engineers. Traffic Engineering Hand Book, 4 th ed., Prentice Hall

2.Transportation System Management ,State of the Art, UMTA, USDOT

3.Khisty CJ and BK Lall, Transportation Engineering: An Introduction Prentice Hall International,

II Year - I Semester	22PTR28	L	T	P	C
		3	0	0	3
Open Elective: a). COMPOSITE MATERIALS					

Course Outcome:

At the end of the course the students will be able to:

- Use of different material to design composites
- Use of different techniques to process different types of composites and know the limitations of each process.
- Understand and describe the basic concept and classification of composite.
- Acquire the knowledge in polymer matrix composites and its processing methods.
- Acquire the knowledge in metal matrix composites and its processing methods.
- Acquire the knowledge in ceramics matrix composites and its processing methods.

UNIT I :

INTRODUCTION: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT II

REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. I sos train and Isos tress conditions.

UNIT III

Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

UNIT IV

Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

UNIT V

Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hydrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

REFERENCES:

1. Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.
2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.
3. Hand Book of Composite Materials-ed-Lubin.
4. Composite Materials – K.K.Chawla.
5. Composite Materials Science and Applications – Deborah D.L. Chung.
6. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi.

II Year - I Semester	22PTR29	L	T	P	C
		3	0	0	3

Open Elective: b). Land Use and Regional Transportation Planning

UNIT-I

URBAN REGIONAL DYNAMICS: Population, Urbanization and Migration, Urban Forms and Structures, Sector theory, Urban nodes, Multi nuclei, Concept of Region, Hierarchy of activities, Issues related to Regional Planning, Methods of Delineation Regions, Hierarchy of Regions, Findings of Commission on Urbanization, Introduction to Micro Economic Theories of Land Use, Concepts by Van Thunan, Christaller and Losch. Course Outcomes:

UNIT-II

LAND USE TRANSPORTATION MODELS: Classification of LUT Models, Economic Base Mechanism, Allocation Mechanism and Spatial Allocation and Employment Relationships, Garin Lowry Models, Contribution by Putman and Wilson, Issues related to Land Use Transport-Interaction, Case Study Examples.

UNIT-III

REGIONAL TRAVEL DEMAND ESTIMATION: Factors affecting Goods and Passenger Flows, Use of Mathematical Models to estimate Freight and Passenger Demand, Abstract Mode Models, Mode Specific Models, Direct Demand Models, IVF Models, IO Model, Case Studies, Truck Terminal Location-Planning.

UNIT-IV

REGIONAL NETWORK PLANNING: Problems in Developing Countries, Network Characteristics- Circuitry, Connectivity, Mobility, Accessibility and Level of Service Concepts – Network Structures and Indices – Network Planning – Evaluation – Graph Theory – Cut sets – Flows & Traversing – Optimum Network – Inter-modal Co-ordination. Special features of low volume Roads – Rural road Network Planning.

UNIT-V

POLICY FORMULATION AND EVALUATION: Application of Land Use Forms and Structures at Urban and Regional Levels, Use of Multi –objective and Goal Programming Techniques, Small Area Management, Residential Neighborhood and Structure Planning.

REFERENCES

1. TomasDela Barra, Integrated Land Use and Transporation Modelling, Cambridge University Press.
2. Chari S.R. Land Use Transportation Planning, Lecture Notes, REC Warangal.
3. Baxter et al, Urban Development Models, Construction Press.
4. Wilson, A.G., Regional and Urban Models in Geography and Planning, Pion Press.
5. Blundon WR,Land Use Transport Models, Vol. 2, Pergumon Press.
6. Morlok EK, Introduction to Transportation Engineering and Planning, McGraw Hill Kogekusha Ltd.

II Year - I Semester	22PTR30	L	T	P	C
		3	0	0	3
Open Elective: c). Operations Research					

OUTCOMES:

At the end of the course, the student will be able to

- Formulate a linear programming problem for given problem and solve this problem by using Simplex techniques
- apply the dynamic programming to solve problems of discreet and continuous variables
- apply the concept of non-linear programming for solving the problems involving non-linear constraints
- carry out sensitivity analysis
- model the real world problem and simulate it

UNIT-I

Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models.

UNIT-II

Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming.

UNIT-III

Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT.

UNIT-IV

Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

UNIT-V

Competitive Models, Single and Multi-Channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation.

REFERENCE:

1.KanthiSwarup, P.K. Gupta and Man Mohan, Operations Research, 14 th Edition, Sultan Chand and Sons, New Delhi, 2008.
2.S. D. Sharma, Operations Research, KedarNath and Ram Nath, Meerut,2008.
3.H.A. Taha, Operations Research, An Introduction, PHI, 2008
4.H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
5.J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008
6.Hitler Libermann Operations Research: McGraw Hill Pub. 2009

		L	T	P	C
II Year –I Sem	**22PTR31**	**0**	**0**	**20**	**10**
DESRTATION PHASE– I					
II Year –II Sem	**22PTR32**	**L**	**T**	**P**	**C**
		0	**0**	**32**	**16**
DESRTATION PHASE–II					