

**BABA MASTNATH UNIVERSITY,ASTHAL BOHAR,  
ROHTAK**

**Scheme of Examination of M.Tech.**

**TRANSPORTATION ENGINEERING**

**W.E.F. SESSION 2022-23.**

**PROGRAMME OUTCOMES:**

PO-I: Study of transportation engineering provides opportunities for understanding the transportation problems and identification of the needs.

PO-II: To find a safe, efficient, cost effective, sustainable transportation system through the land-use transportation planning, infrastructure planning, design, construction, management and environmental protection measures.

**PROGRAMME SPECIFIC OUTCOMES:**

- Ability to identify, formulate and solve complex transportation problems and research need.
- Ability to apply knowledge of mathematics, science, economics, statistics and engineering to solve complex problems in transportation.
- Ability to plan, design, and implement safe, efficient, cost effective, sustainable transportation projects to meet societal and environmental needs.
- Ability to design and conduct complex transportation engineering experiments, surveys as well as to analyze and interpret the experimental/ collected data.
- Ability to use the techniques, skills, and modern engineering tools necessary for transportation engineering practices.
- Ability to assess impact of contemporary social/ political issues on professional practices.
- Ability to recognize the sustainability and environmental impact of the transportation engineering projects.
- Ability to follow prescribed norms, responsibilities and ethics in engineering practices.
- Ability to work effectively as an individual and in a team.
- Ability to communicate effectively through oral, written and pictorial means with engineering community and the society at large.
- Ability to recognize the need for and to engage in lifelong learning.
- Ability to understand and apply engineering and management principles in executing projects.

# BABA MASTNATH UNIVERSITY, ASTHAL BOHAR, ROHTAK

## Scheme of Examination

M.Tech. (TRANSPORTATION ENGINEERING)

### SEMESTER-I

EFFECTIVE FROM 2022-23

Course No.	Course Title	Teaching Schedule			TOTAL CREDITS	Marks			Total	Duration of Exam (Hrs)
		L	T	P		Sessional	THEORY	PRACTICAL		
22CET01C1	Transportation Systems Planning	4	-	-	4	50	100		150	3
22CET01C2	Highway & Airport Pavement Materials	4	-	-	4	50	100		150	3
22CET01C3	Numerical Methods & Applied Statistics	4	-	-	4	50	100		150	3
22CET01C4	High Rise Structures	4	-	-	4	50	100		150	3
22CET01C5	Planning and Design of Airports	4	-	-	4	50	100		150	3
22CET01C6	Seminar	-	-	2	2	50	-		50	
22CET01CL1	Computational Laboratory	-	-	2	2	50	-	50	100	3
22CET01CL2	Transportation Engineering Laboratory	-	-	2	2	50	-	50	100	3
<b>TOTAL</b>		20	-	4	26	400	500	100	1000	-

NOTE- Examiner will set nine question in total. Question one will be compulsory and will comprises of all section and remaining eight questions to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

# BABA MASTNATH UNIVERSITY, ASTHAL BOHAR, ROHTAK

## Scheme of Examination M.Tech. TRANSPORTATION ENGINEERING SEMESTER-II EFFECTIVE FROM 2022-23

Course No.	Course Title	Teaching Schedule			TOTAL CREDIT	Marks		practical	Total	Duration of Exam (Hrs)
		L	T	P		Sessional	Exam.			
22CET02C1	Analysis & Structural Design of Pavements	4	-	-	4	50	100	-	150	3
22CET02C2	Mass Transit Systems	4	-	-	4	50	100	-	150	3
22CET02C3	Seminar	-	-	2	2	50	-	-	50	
22CET02CL1	Traffic & Transportation Engineering Laboratory	-	-	2	2	50	-	50	100	3
22CET02CL2	Transportation Engineering Design Practice	-	-	2	2	50	-	50	100	3
-	Elective	4	-	-	4	50	100	-	150	
-	Open elective	3	-	-	3	50	100	-	150	3
-	Foundation elective	3	-	-	2	50	100	-	150	3
<b>TOTAL</b>		<b>17</b>	<b>-</b>	<b>6</b>	<b>23</b>	<b>400</b>	<b>500</b>		<b>1000</b>	<b>-</b>

NOTE- Examiner will set nine question in total. Question one will be compulsory and will comprises of all section and remaining eight questions to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Note:**

1. \* Choose any one subject from Elective-I. ( List given)
2. \*\* Choose any one subject from the pool of open electives subjects provided by the university.

\*\*\* Choose any one subject from the pool of Foundation electives subjects provided by the university.

**Elective-**

22CET02D1- Bridge Engineering

22CET02D2 –Highway Construction Practice

22CET02D3- Design and Construction of Rural Roads

<b>Open elective</b>	S. NO.	Subject Name	Code
	1.	Ground Improvement Techniques	22CET0201
	2.	Design and Maintenance of Rural Roads	22CEST202
	3.	Project Planning and Management	22CEST203

<b>Foundation Elective</b>	S.NO.	Subject Name	Code
	1.	Disaster Management	22ENV02F1
	2.	Fundamental of Marketing	22FOM02F2
	3.	Constitutional Law	22LAW02F3
	4.	Basics of E-Commerce	22COM02F4

# BABA MASTNATH UNIVERSITY, ASTHAL BOHAR, ROHTAK

## Scheme of Examination

### M.Tech. TRANSPORTATION ENGINEERING

#### SEMESTER-III

EFFECTIVE FROM 2023-24

Course No.	Course Title	Teaching Schedule			credits	Marks			Total	Duration of Exam (Hrs)
		L	T	P		Sessional	Exam.	Practical		
23CET03C1	Traffic Engineering and Traffic Flow Theory	4	-	-	4	50	100	-	150	3
23CET03C2	Transportation and Environment	4	-	-	4	50	100	-	150	3
23CET03C3	Seminar	-	-	2	2	50	-	-	50	-
23CET03C4	Dissertation Phase-I	-	-	2	2	100	-	-	100	-
23CET03CL1	Cad Lab	-	-	2	2	50	-	50	100	
23CET03CL2	Project	-	-	2	2	50	-	50	100	
	Open Elective	3	-	-	3	50	100	-	150	
<b>TOTAL</b>		<b>11</b>	<b>-</b>	<b>8</b>	<b>19</b>	<b>400</b>	<b>300</b>	<b>100</b>	<b>800</b>	

NOTE- Examiner will set nine question in total. Question one will be compulsory and will comprises of all section and remaining eight questions to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

- Choose any one subject from the pool of open electives subjects provided by the university.

Open elective	S. NO.	Subject Name	Code
	2.	Geo environmental Engineering	22CET0301
	3.	Geometric Design of Highways	22CET0302

# BABA MASTNATH UNIVERSITY,ASTHAL BOHAR, ROHTAK

Scheme of Examination

M.Tech. TRANSPORTATION ENGINEERING

SEMESTER-IV

EFFECTIVE FROM 2023-24

Course No.	Course Title	Teaching Schedule			Marks		Total	NO OF CREDITS
		L	T	P	Internal	External		
23CET04C1	DISSERTATION & VIVA (Phase II)	-	-	-	250	500	750	20
<b>TOTAL</b>			-		250	500	750	

NOTE:

Students have to publish a research paper in a journal/ conference of the research work done in the semester.

## 22CET01C1-TRANSPORTATION SYSTEMS PLANNING

L- T- P  
4- 0- 0

Exams Marks :100  
Sessional Marks :50  
Total Marks :150  
Duration of Exam :3hrs.

**Course Outcomes (CO'S):** At the end of the course, the student shall be able to: CO1 Ability to identify, formulate and solve complex transportation system problems.

CO2 Analyze about process of traffic management techniques.

CO3 Ability to use the techniques, skills, and modern engineering tools necessary for transportation engineering practices.

CO4 Ability to understand and apply engineering and management principles in executing projects.

**NOTE-** Examiner will set nine question in total. Question one will be compulsory and will comprises of all section and remaining eight questions to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

### UNIT-1

Brief Description of urban and regional transportation systems, Definition of a system; System analysis: scope and limitations,

### UNIT-II

Transportation planning based upon system Analysis, Survey and analysis of existing conditions.

### UNIT-III

Models for trip generation, trip Distribution, traffic assignment and modal split; Analysis of future conditions,

### UNIT-IV

Plan synthesis and evaluation. Traffic management techniques for improving vehicular flow.

### Reference:

- 1.L.R. Kadiyalli, Traffic Engineering and Transport Planning, Khanna Publishers, 7th edition, 2008
1. C. S. Papacostas, P. D. Prevedouros, Transportation Engineering and Planning, PHI Publication, 3rd edition, 2002.
2. M.J. Bruton, Introduction to Transportation Planning (Built Environment), Routledge, 1992.
3. J.D. Fricker and R. K. Whitford, Fundamentals of Transportation Engineering: A Multimodal System Approach, Pearson Education, PH, 2005.
4. Ortuzar & Willumsen, Modeling Transport, John Wiley, 1990



# 22CET01C2-HIGHWAY AND AIRPORT PAVEMENT MATERIALS

L- T- P  
4- 0- 0

Exams Marks :100  
Sessional Marks :50  
Total Marks :150  
Duration of Exam :3hrs.

**Course Outcomes (CO'S):** At the end of the course, the student shall be able to:

C01 . Understand the basic construction materials and their suitability as road materials.

C02 Analyse the aggregates and design aggregate gradation for construction of pavement layers.

C03 Characterize the binder material for bituminous roads and provide an optimum bituminous mix design.

C04 understand mix design using different materials for various components of a CC pavement.

**NOTE-** Examiner will set nine question in total. Question one will be compulsory and will comprises of all section and remaining eight questions to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## UNIT-I

Conventional aggregates and their evaluation, Bituminous binders- Properties, testing and Applications;

## UNIT-II

Bituminous mixes- Design, testing and evaluation; Materials for cement Concrete and semi-rigid pavements,

## UNIT-III

Design of mixes for stabilized roads; Non-conventional and new pavement materials- their application and limitations.

## UNIT-IV

Periodic and routine maintenance for different types of pavements.  
Highway Drainage: Design of surface and subsurface drainage.

## Reference:

1. Atkins & Harold, Highway Materials, Soils, and Concretes, Prentice Hall Pearson, 4th Ed., 2003
2. Y. Richard Kim, Modeling of Asphalt Concrete, 2008, McGraw Hill Professional.
3. Relevant IRC, ASTM, AASHTO and other Codes, Manuals and Specifications
4. P.G. Lavin, Asphalt Pavements, Taylor and Francis, 1st Ed. 2007

## 22CET01C3 -NUMERICAL METHODS AND APPLIED STATISTICS

L- T- P  
4- 0- 0

Exams Marks : 100  
Sessionals Marks : 50  
Total Marks : 150  
Duration of Exam : 3 hrs.

### COURSE OUTCOMES:

CO1: To solve linear and non-linear systems of equations by using various methods/approaches of numerical analysis

CO2: To optimize the problems of LPP by using several methods.

CO3: To understand the difference between Binomial, Poisson and normal distributions.

CO4: To grasp the knowledge of sampling distributions.

CO5: To understand the concepts of correlation and regression.

**NOTE-** Examiner will set nine question in total. Question one will be compulsory and will comprises of all section and remaining eight questions to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

### UNIT-I

Linear system – Gaussian elimination and Gauss – Jordan methods – matrix inversion – Gauss seidel method – Nonlinear equations – Regula falsi and Newton- Raphson methods – interpolation – Newton’s and Lagrange’s interpolation.

### UNIT-II

Linear Programming – Graphical and Simplex methods – Measures of central tendency, dispersion, skewness and Kurtosis – Probability – conditional probability – Bayes’ theorem, Random variable – two dimensional random variables – standard probability distributions – Binomial Poisson and normal distributions - moment generating function.

### UNIT-III

Sampling distributions – confidence interval estimation of population parameters – testing of hypotheses – Large sample tests for mean and proportion – t-test, F-test and Chi-square test – curve fitting-method of leastsquares

### UNIT-IV

Regression and correlation – rank correlation – multiple and partial correlation – analysis of variance one way and two way classifications – experimental design – Latin square design – Time series analysis.

### Reference:

1. Bowker and Liberman, Engineering Statistics, Prentice-Hall, 1972.
2. Venkatraman, M.K., Numerical Methods in Science and Engineering, National Publisher Company.

## 22CET01C4-HIGHRISE STRUCTURES

L- T- P	ExamsMarks	:100
4- 0- 0		Sessional Marks :50
		Total Marks :150
		Duration of Exam :3hrs.

**Course Outcomes (CO'S):** At the end of the course, the student shall be able to:

CO1 . Analyse the design criteria and loading conditions for buildings

CO2 Analyse the conceptual designs of lateral load resisting systems for buildings

CO3 Identify and analyse different structural systems using case study buildings.

CO4 Analyse the conceptual designs of floors using different floor systems

**NOTE-** Examiner will set nine question in total. Question one will be compulsory and will comprises of all section and remaining eight questions to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

### UNIT-I

Analysis of tall building frames, Lateral load analysis, multi bay frames, gravity loads, settlement of foundation.

### UNIT-II

Analysis of shear walls - plane shear walls, in filled frames, coupled frames, frames with shear walls.

### UNIT-III

Analysis of floor system in tall buildings, Vierendal girders, diagrid floors.

### UNIT-IV

Elastic and inelastic stability of frames and shear walls. Analysis of thermal stresses.

### Reference:

1. BSS mith & A Coull, *Tall Building Structures*: -John Wiley & Sons.  
W.Schueller, *High Rise Building Structures*: John Wiley& Sons.

# 22CET01C5-PLANNING AND DESIGN OF AIRPORTS

L- T- P  
4- 0- 0

Exams Marks : 100  
Sessionals Marks :50  
Total Marks : 150  
Duration of Exam :3hrs.

**Course Outcomes (CO'S):** At the end of the course, the student shall be able to:

CO1 . Understand the various components of an airport and aircraft characteristics affecting the design of airports

CO2 Design the runway and taxiway geometrics based on the likely aircrafts using the airport.

CO3 . Plan the requirements of terminal area and suggest an optimum layout for the terminal area based on passenger and baggage volume.

CO4 Understand the various air traffic control aids required for safe landing and take-off of aircrafts at the airport.

**NOTE-** Examiner will set nine question in total. Question one will be compulsory and will comprises of all section and remaining eight questions to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## UNIT-I

Classification of airports- ICAO standards. Growth of air transport, airport organization and associations

## UNIT-II

Planning for airport- Airport Site Selection, Airport components- Zoning laws ; Runways- orientation and geometric design-Runway patterns ; Taxiways- alignment geometry and turning radius- exit taxiways ; Aprons- planning and design ;

## UNIT-III

Design principles of critical, semi-critical, non-critical airport pavements- FAA and PCA methods ; Airport hangars- their planning and design criteria ;

## UNIT-IV

Airport landscaping, grading and drainage general aspects; Airport terminal and amenities; Airport lighting, day and night landing aids and marking.

### Reference:

1. N.J.Ashford,P.H.Wright, *AirportEngineering*,3rdEdition,1992,JohnWiley
2. R.M.Horonjeff,F.X.McKelvey,W.JSproule,*SethYoung,PlanningandDesignofAirports*, TMHInternationalPublishers,FifthEdition,2009
3. Khanna,AroraandJain,*PlanningandDesignofAirports*,NemchandBros.,2001
4. Wells, Alexander; Young, Seth, *Airport Planning & Management*, McGraw Hill,5thEdition, July,2009

5. De N. Richard, & Odoni, *Airport Systems: Planning, Design, and Management*, McGrawHillAmedeo, 1st Edition, 2004.

## 22CET01CL1 COMPUTATIONAL LABORATORY

L- T- P  
0- 0- 2

Exams Marks :50  
Sessionals Marks :50  
Total Marks :100  
Duration of Exam :3hrs.

**Course Outcomes (CO'S):** At the end of the course, the student shall be able to:

CO1 . Understand the C language problems in civil engineering.

CO2. Analyse the problems with matrix method

### **Content-**

Computer programming in C++. ; Development of computer programs to solve problems related to civil engineering using matrix method.

## 22CET01CL2-TRANSPORTATION ENGINEERING LABORATORY

L- T- P  
0- 0- 2

Exams Marks :50  
Sessional Marks :50  
Total Marks :100  
Duration of Exam :3hrs.

Course objectives: The objective of this course is to make students learn

- 1.The procedure and test the basic properties of bitumen and modified binders, learn bituminous mix design
2. Learn field tests on pavement evaluation

### Tests

1. Penetration Ratio and Penetration Test
2. Viscosity Number of Bituminous binders
3. 10%Fines Test for aggregates
4. Moisture sensitivity test for bitumen adhesion
- 5 Viscosity-Temperature relationships for bituminous binders.

### References:

1. Relevant IS and IRC codes
2. Khanna, S.K., Justo, C.E.G., and Veeraragavan, A., 'Highway Materials and Pavement Testing', Nem Chand and Bros, Roorkee
3. Gambhir, M. L., 'Concrete Manual', Dhanpat Rai and sons New Delhi

# 22CET02C1-ANALYSIS AND STRUCTURAL DESIGN OF PAVEMENTS

L- T- P  
4- 0- 0

Exams Marks : 100  
Sessionals Marks :50  
Total Marks : 150  
Duration of Exam :3hrs.

**Course outcomes:** This course will enable students to

1. Understand the factors affecting pavement design and performance
2. Evaluate the strength of soil subgrade soil and factors that affect the behavior of soil.
3. Compute the stresses and deflections in flexible pavement layers under the action of wheel loads.
4. Design the thickness of flexible pavements by different methods under different exposure conditions and materials.
5. Design the thickness of concrete pavements and joints associated with CC pavements in addition to the computation of stresses in CC pavements.

**NOTE-** Examiner will set nine question in total. Question one will be compulsory and will comprises of all section and remaining eight questions to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## UNIT-I

Theories of pavement design, types, functions, choice Factors affecting design and performance of flexible and rigid pavements

## UNIT-II

Methods of flexible pavement design- applications of CBR, Burmister, Asphalt Institute, AASHTO and IRC Methods. ;

## UNIT-III

Load and temperature stresses in rigid pavements-Westergaad's, Bradburry's and Pickets concepts; Design of rigid pavements by PCA, AASHTO and IRC methods;

## UNIT-IV

Design of joints in rigid pavements; Evaluation of pavement distress; Design aspects of flexible and rigid overlays.

## Reference:

1. Yoder and Witzack, *Principles of Pavement Design*, John Willey and Sons, October1975
2. YangH.Huang, *Pavement Analysis and Design*,PH,2ndEdition,2004.
3. *Relevant IRC, ASTM, AASHTO and other Codes*, Manuals and Specifications
4. D.Croney & P.Croney, *the Design and Performance of Road Pavements*, McGraw Hill Professional, 3rd Edition. 1998 Richard J Salter, *Highway design and construction*, Palgrave Macmillan, 1988



## 22CET02C2MASS TRANSIT SYSTEMS

L- T- P  
4- 0- 0

ExamsMarks :100  
SessionalsMarks :50  
TotalMarks :150  
DurationofExam :3hrs.

### Course Outcomes:

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

1. Understand Plan ,construct and operate the modes of mass transit.
2. Understand trip interchanges and assignments.
3. Understand modes of mass transit.
4. Understand case studies

**NOTE-** Examiner will set nine question in total. Question one will be compulsory and will comprises of all section and remaining eight questions to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

### UNIT-I

Mass transit concepts trip interchanges and assignments Urban transportation problems, Modes of mass transit- their planning, construction and operation,

### UNIT-II

Case studies of existing mass transit systems Technical and economic evaluation of mass transit projects History and role of public transportation in urban development Urban passenger transport modes

### UNIT-III

Vehicle characteristics and motion Highway transit modes: Buses and trolleybuses Rail transit modes: street cars, light rail, rapid transit and regional rail

### UNIT-IV

New concepts and proposed modes Bus rapid transit system Principles of bus rapid transit system Lane priority Contra flow lanes Bus rapid transit: a sustainable approach to mass transit Rapid transit systems Para-transit system Transportation systems.

### References:

1. C. S. Papacostas, P. D. Prevedouros, *Transportation Engineering and Planning*, PHI Publication, 3rd edition, 2002
2. S.Grava, *Urban Transportation Systems*, Mc.GrawHill Professional, 1st Ed. 2002.
3. J.D. Fricker, & R.K. Whitford, *Fundamentals of Transportation Engineering*, Pearson, PH, 2004
4. V.R. Vuchic, *Urban Transit Systems and Technology*, John Wiley & Sons, February 2007
5. C.A.O'Flaherty, *Transport Planning and Traffic Engineering*, Arnold, 1997
6. J.E.Anderson, *Transit Systems Theory*, Lexinton Books, USA

## 22CET02CL1-TRAFFIC & TRANSPORTATION ENGINEERING LABORATORY

L- T- P  
0 0 2

Exams Marks :50  
Sessionals Marks :50  
Total Marks :100  
Duration of Exam :3hrs.

### Course Outcomes:

- 1.Ability to characterise the traffic stream.
2. Ability to develop various traffic stream models.
3. Ability to model traffic queue.
- 4.Ability to characterise pedestrian.

### TESTS-

- Traffic volume studies Spot speed studies
- Accident and Parking studies
- Design of Traffic rotaries Intersections
- Traffic simulation modeling
- Road safety audit
- 

Use of software for geometric design and alignment of highway

Manual:

1. Highway Materials testing- S.K. Khanna & C.E.G. Justo. Nem Chand & Brothers.

# 22CET02CL2-TRANSPORTATION ENGINEERING DESIGN PRACTICE

L- T- P  
0 0 2

Exams Marks :50  
Sessional Marks :50  
Total Marks :100  
Duration of Exam :3hrs.

## Course Outcomes:

1. Ability to characterise the road aggregates.
2. Ability to characterise the paving grade bitumen.
3. Ability to characterise the Sub-grade Soil

## -Tests

1. Soil-Cement / Soil-lime Mix Design
2. Blending of aggregates
3. Design and blending of sub-base material Characterization of Aggregate and Bituminous materials
4. Modified Marshall test for bituminous mixes
5. Repeated Load Testing of pavement materials Use of software's foR Pavement Analysis and Design

## Manual:

1. Highway Materials testing- S.K. Khanna & C.E.G. Justo. Nem Chand & Brothers.

## 22CET02D1-BRIDGE ENGINEERING

L- T- P  
4- 0- 0

Exams Marks : 100  
Sessionals Marks : 50  
Total Marks : 150  
Duration of Exam : 3hrs.

Course Outcomes: At the end of the course the students should be able to:

1. Understand design and construct the road joints.
2. Understand Design bridge foundation.
3. Understand repair and maintenance of bridges.
4. Understand construction joints.

**NOTE-** Examiner will set nine question in total. Question one will be compulsory and will comprises of all section and remaining eight questions to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

### UNIT-I

Introduction, historical review, engineering and aesthetic requirements in bridge design. Introduction to bridge codes. Economic evaluation of a bridge project.

### UNIT-II

Site investigation and planning; Scour-factors affecting and evaluation. Bridge foundations - open, pile, well and caisson. Piers, abutments and approach structures;

### UNIT-III

Superstructure-analysis and design of right, skew and curved slabs. Girder bridges - types, load distribution, design. Orthotropic plate analysis of bridge decks.

### UNIT-IV

Introduction to long span bridges - cantilever, arch, cable stayed and suspension bridges. Methods of construction of R.C Bridges, Prestressed concrete bridges and steel bridges Fabrication, Launching & creation. Design and construction of construction joints.

### Reference:

1. V. K. Raina, *Concrete Bridges Practice Analysis, Design and Economics*, Shroff Publications, New Delhi 2nd Ed. 2005.
  2. Vazirani, Ratwani and Aswani, *Design of Concrete Bridges*, Khanna Publishers, 2nd Ed. 2008.
  3. IRC codes for Road bridges-IRSSec I, II, III
  4. IRC Codes of Practice for Railway bridges.
- B.M.Das, *Principles of Foundation Engineering*, Thomson, Indian Edition, 2003.

## 22CET02D2-HIGHWAY CONSTRUCTION PRACTICE

L- T- P  
4- 0- 0

Exams Marks : 100  
Sessionals Marks : 50  
Total Marks : 150  
Duration of Exam : 3hrs.

### Course Objectives

- To impart knowledge about pavement construction and maintenance
- To introduce the fundamental concepts of highway construction
- To enable the students to understand the importance of right construction methodology

**NOTE-** Examiner will set nine question in total. Question one will be compulsory and will comprises of all section and remaining eight questions to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

### UNIT-I

Highway construction: road types--earth roads, gravel roads, WBM/WMM/BBM base courses, GSB.

### UNIT-II

Construction of bituminous pavements: various types of bituminous constructions. Prime coat, tack coat, seal coat and surface dressing. Construction of premix carpet, BM, DBM and AC. Mastic asphalt.

### UNIT-III

Machinery for Earthwork and Construction of Pavements: bitumen boiler, sprayer, pressure distributor, hot-mix plant, cold-mix plant, tipper trucks, mechanical paver or finisher, rollers. Machinery involved in construction, slip-form pavers, and joints in CC pavements. Introduction to various IRC and MORTH specifications.

### UNIT-IV

Construction of other types of pavements: reinforced cement concrete pavements, prestressed concrete pavements, roller compacted concrete pavements and fibre reinforced concrete pavements.  
Failures of flexible and rigid pavements: Maintenance, evaluation and its strengthening.

### References:

1. MOST, Specifications for Road and Bridge Work (4th Revision), Ministry of Road Transport and Highways, 2001.
2. C. A. O' Flaherty, Highways – The Location, Design, Construction, & Maintenance of Pavements, Butterworth Heinemann, 2002.
3. R. N. Hunter, Bituminous Mixtures in Road Construction, Thomas Telford Services Ltd., 1995.
4. P. H. Wright, Highway Engineering, John Wiley & Sons, 1996.
5. C. H. Oglesby, and R. G. Hicks, Highway Engineering, John Wiley & Sons, 198.

## 22CET02D3-DESIGN AND CONSTRUCTION OF RURAL ROADS

L- T- P  
4- 0- 0

ExamsMarks : 100  
SessionalsMarks :50  
TotalMarks : 150  
DurationofExam :3hrs.

### Course Objectives

- To impart the knowledge of different types of rural road and their features
- To make the students learn how to plan a rural network
- To impart the primary knowledge of the materials used in rural road constructions
- To make the students understand the problems faced in maintaining the rural road after construction

**NOTE-** Examiner will set nine question in total. Question one will be compulsory and will comprises of all section and remaining eight questions to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

### UNIT-I

**Planning of rural road net work** – Concept of core and non-core roads, general principle, guidelines laid down in recent 20-year plans and in PMGSY

### UNIT-II

Guidelines for alignment and geometric design of rural/low volume roads and safety aspects. Investigations and surveys, soil and material surveys, Promoting use of alternate marginal / low cost / waste / stabilized local materials in rural road works, fly ash in fill and other layers, use of other waste materials.

### UNIT-III

Soil stabilization methods – mechanical, soil cement, soil lime, soil-lime-pozzolana, soil-lime-cement stabilization. Design of different types of pavements for rural roads, choice of pavement type / pavement materials. Guidelines and specifications by IRC, NRRDA and MORD. Study of requirements of surface and subsurface drainage, and cross drains, standard design of culverts and small bridges.

### UNIT-IV

Specifications and steps for the construction of different components of rural / low volume roads including pavement layers, quality control during construction. Maintenance of rural roads – shoulders, side and cross drains. Pavement distress, different types of failures and maintenance measures. Preventive maintenance works.

### References:

1. Brown, J. Victor, and C. N. Conner, Low cost roads and bridges, Gillette Co.Publications, 1933.
2. K.N.Ramanujam,RuralTransportinIndia,MittalPublications,1993.
- 3.R. Lamm, A. Beck, and T. Ruscher, How to Make Two-Lane Rural Roads Safer,WITPress, 2007.
4. L.Odier,LowCostRoads:Design,ConstructionandMaintenance, Unesco,Butterworths,1971.
- 5G.R.Chatburn,andJ.WileyandSons,HighwayEngineering,RuralRoadsandPavements, Inc.Publication,2010.
6. RuralDevelopmentStudy,WorldBankPublications,1998
7. Geometric Design Standards forRural (Non-Urban)Highways,IRC:73-1980.
8. RuralRoadsManual,IRC:SP:20-2002.
9. Manual on Economic Evaluation of Highway Projects in India, IRC: SP: 30-1993.
10. HillRoadManual,IRC:SP:48-1998.
11. GuidelinesforQualitySystemsforRoadConstruction,IRC:SP:57-2000.
12. GuidelinesfortheDesignofFlexiblePavementsforLowVolumeRuralRoads,IRC:SP: 72-2007.
13. ManualforConstructionandSupervisionofBituminousWorks,MORT&H:2001.
14. Specifications for Rural Roads, Ministry of Rural Development, Government ofIndia,IRC, 2004.
15. QualityAssurance HandbookforRuralRoadsVolume-IandVolume-II,MinistryofRuralDevelopment,Government ofIndia, NRRDA.

## 22CET0201-GROUND IMPROVEMENT TECHNIQUES

L- T- P  
3- 0- 0

Exams Marks : 100  
Sessionals Marks :50  
Total Marks : 150  
Duration of Exam :3hrs.

**Course Outcomes (CO'S):** At the end of the course, the student shall be able to:

CO1 . Understand the fundamental concepts of ground improvement techniques

CO2 Apply knowledge of mathematics, Science and Geotechnical Engineering to solve problems in the field of modification of ground required for construction of civil engineering structures.

CO3 . Understand the concepts of chemical compaction, grouting and other miscellaneous methods.

CO4. Impart the knowledge of geosynthetics, vibration, grouting and Injection.

**NOTE-** Examiner will set nine question in total. Question one will be compulsory and will comprises of all section and remaining eight questions to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

### UNIT-I

Compaction: Theory of compaction, Shallow Surface Compaction - Equipment, Placement water content, factors affecting shallow compaction; Deep compaction: Methods- Vibro floatation, Terraprobe method, Pounding, Blasting.

### UNIT-II

VerticalDrains: Sanddrains, Sandwicks, Rope drains, Design of vertical drains, Stone columns, application of the techniques to Marine clays.

Stabilization: Introduction, objectives, Methods of stabilization – Mechanical, Cement, Lime, Bituminous, Calcium chloride; construction methods, factors affecting stabilization of soils; Deep Mixing methods-Soil lime Columns and Cement Lime Columns, applications

### UNIT-III

Dewatering: Definition, necessity, Methods of dewatering-Intercept orditch, Single, Multistage and Vacuum well points, Horizontal wells, Electro-osmosis. Permanent drainage by Foundation drains and Blanket drains.

### UNIT-IV

Grouting:Definition, Objectives of grouting, Grouts and the irproperties, Categories of Grouting, Grouting methods: Ascending, Descendin and Stage Grouting in Soils, Hydrofracture, Grouting Equipment.

In-situ Reinforcement: Ground Anchors, Tiebacks and Soil Nailing, Micropiles.



*Text Book*

*1. Ground Improvement Techniques by P.Purushothama Raj, Laksmi Publications, NewDelhi.*

*Reference Books*

- 1. Engineering Principles of Ground Modification by Monfred RH ausmann, McGraw Hill Publishing Co.*
- 2. Reinforced Soil and Its Engineering Applications by Swami Saran, I.K.International Pvt.Ltd.*

## 22CET0202-DESIGN AND MAINTENANCE OF RURAL ROADS

L- T- P  
3- 0- 0

Exams Marks : 100  
Sessionals Marks :50  
Total Marks : 150  
Duration of Exam :3hrs.

**Course Outcomes (CO'S):** At the end of the course, the student shall be able to:

CO1 . Course Outcomes: Ability to align rural roads.

CO2 Ability to characterise the materials.

CO3 Ability to design and construct rural roads.

CO4 Ability to use of waste materials in pavement construction.

**NOTE-** Examiner will set nine question in total. Question one will be compulsory and will comprises of all section and remaining eight questions to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

### UNIT-I

Introduction: Importance of Rural roads, Classification of rural roads, Terrain classification, Socio-economic impact of rural roads.

Planning and Alignment: Data base for master plan, Concept of network planning, RuralRoadsplan,Roadalignment,Governingfactorsforrouteselection,Factorscontrollingalignment, Special considerations while aligning hill roads, Surveys, Detailed project report, Environmental issues

### UNIT-II

Geometric Design: Introduction, Design speed, Basic principles of geometric design, Elements, Horizontal and vertical alignment, Alignment compatibility, Lateral and vertical clearances

Road Materials: General, Soil and material surveys, Soil as road construction material, Stabilized soils, Aggregates for pavement courses, New material sand stabilizers, Materials for bituminous construction, Materials for semi-rigid and rigid pavement, Materials for special pavements Climatic suitability of concrete materials

### UNIT-III

Pavement Design: Introduction, Design parameters, Pavement components, Design of flexible pavement, Design of semi-rigid pavement, Design of rigid pavement, Design of special pavements, Drainage and Shoulders

Specifications and Construction: General, Selection of construction materials and methodology, Earthwork, Sub-base, Base course, Bituminous constructions, Semi-rigid pavement construction, Concrete pavements, Construction of special pavements, Equipment required for different operations.

#### **UNIT-IV**

Green Road Concept and Use of Waste Materials: Introduction, Significance of green roads, Fly ash for road construction, Iron & steel and copper slags, Lime-rice husk ash concrete, Recycled concrete aggregate, Other waste materials.

Quality Control in Construction: General, Pre-requisite, Specifications and codes of practice, Quality control tests during construction. Strengthening of pavements, Planning schedule for pavement maintenance.

Reference books:

1. IRC manual for rural roads. Special publication – 20(2002)
2. HMSO, Soil Mechanics for rural Engineers in, London
3. IRC related code books
4. NRRDA – guidelines and code books M-Tech (Transportation Engg.)

## 22CET0203-PROJECT PLANNING AND MANAGEMENT

L- T- P  
3- 0- 0

Exams Marks : 100  
Sessionals Marks :50  
Total Marks : 150  
Duration of Exam :3hrs.

**Course Outcomes (CO'S):** At the end of the course, the student shall be able to:

1. Ability to characterise a project.
2. Ability to schedule and plan a project.
3. Ability to analyse the project.

**NOTE-** Examiner will set nine question in total. Question one will be compulsory and will comprises of all section and remaining eight questions to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

### UNIT-I

Introduction to Project Management: Systems Approach, Systems Theory and Concepts, Organization, Management Functions, Overview of Management Objectives, Tools and Techniques, Project Management – Processes and organizational 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 Project Selection, Break-Even Analysis, Cost Modeling, Energy Modeling, Life Cycle Cost Approach.

Contract Management: Tendering and Contracting, Laws of Contracts, sub contracts, Potential Problems, Post Contract Problems, Documents, Conditions, Arbitration, Special Features of International Contracts.

### UNIT-III

Quality Management and Safety in Construction Industry: Quality control by statistical methods, sampling plan, control charts, ISO 14000, Safety Measures, Safety Programs, Safety Awareness and Implementation of Safety Plan – Compensation.

Human Resource Management: Man Power Planning - Training - Motivation – Industrial Relations – Welfare Measures - MIS-Components and Structure- Personal Management.

### UNIT-IV

Resource Management and Inventory: Basic concepts, labour requirements and 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. Risk management, identification and nature of construction risks

*Text Books*

1. *Herold Kerzner-Project Management- A systems approach to Planning, Scheduling and Controlling., CBS Publishers and Distributors.*

## 22ENV02F1 Disaster Management

<b>L T P</b>	<b>Marks</b>	<b>Credits</b>
<b>3 - -</b>	<b>Exam: 100</b>	<b>3</b>
	<b>Sessional: 50</b>	
	<b>Total: 150</b>	<b>3</b>
	<b>Duration of Exam: 3 hrs.</b>	

### Course Objectives-

- To teach Fundamentals of Disaster Management.
- To Special marketing environment.
- To introduce various Floods and Cyclones.
- To teach Earthquakes.
- To improve Mitigation efforts.

### Course Outcomes-

- Student will be able to Coastal erosion due to natural and manmade structures.
- Student will be able to causes and physical characteristics, mitigation of risks.
- Students will be able Policy for disaster reduction.

### UNIT- I

**Disaster-** Causes and phases of disaster, Rapid onset and slow onset disasters. Nature and responses to geo-hazards, trends in climatology, meteorology and hydrology. Seismic activities. Changes in Coastal zone, coastal erosion, beach protection. Coastal erosion due to natural and manmade structures.

### UNIT- II

**Floods and Cyclones:** causes of flooding, Hazards associated with flooding. Flood forecasting. Flood management, Integrated Flood Management and Information System (IFMIS), Flood control. Water related hazards- Structure and nature of tropical cyclone, Tsunamis – causes and physical characteristics, mitigation of risks.

### UNIT- III

**Earthquakes:** Causes and characteristics of ground-motion, earthquake scales, magnitude and

intensity, earthquake hazards and risks, Volcanic land forms, eruptions, early warning from satellites, risk mitigation and training, Landslides.

#### **UNIT – IV**

**Mitigation efforts:** UN draft resolution on Strengthening of Coordination of Humanitarian Emergency Assistance, International Decade for Natural Disaster Reduction (IDNDR), Policy for disaster reduction, problems of financing and insurance.

#### **Reference Books:**

1. Bolt, B.A. Earthquakes , W. H. Freeman and Company, New York. 1988
2. Carter, N,W. Disaster Management: A Disaster Manager's Hand Book, AsianDevelopment Bank, Manila. 1992
3. Gautam Ashutosh. Earthquake: A Natural Disaster, Ashok Publishing House, New Delhi. 1994
4. Sahni, P.and Malagola M. (Eds.).Disaster Risk Reduction in South Asia, Prentice-Hall of India, New Delhi. 2003.
5. Sharma, V.K. (Ed.). Disaster Management, IIPA, New Delhi. 1995.
6. Singh T. Disaster management Approaches and Strategies, Akansha Publishing House, New Delhi. 2006
7. Sinha, D. K. Towards Basics of Natural Disaster Reduction, Research Book Centre, New Delhi. 2006
8. Smith, K. Environmental Health, Assessing Risk and Reduction Disaster, 3rd Edition, Routledge, London. 2001 21

**22FOM02F2**

**Fundamentals of Marketing**

	<b>Marks</b>	<b>Credits</b>
<b>L T P</b>	<b>Exam: 100</b>	<b>3</b>
<b>3 - -</b>	<b>Sessional: 50</b>	
	<b>Total: 150</b>	<b>3</b>
	<b>Duration of Exam: 3 hrs.</b>	

**Course Objectives-**

- To teach Fundamentals of Marketing.
- To Special marketing environment.
- To introduce various Fundamental corporate orientation.
- To teach consumer markets.
- To improve Advertising and sales promotion.

**Course Outcomes-**

- Student will be able to product mix and product line decisions.
- Student will be able to wholesaling and retailing.
- Students will be able marketing strategies.

**Unit -I**

Nature and scope of marketing: corporate orientation towards marketplace; building and delivering customer value and satisfaction; retaining customers; marketing environment.

**Unit -II**

Analyzing consumer markets and buyer behaviour; market segmentation, positioning and targeting; tools of product differentiation; marketing strategies in the different stage of the product life cycle.

**Unit -III**

New product development process; product mix and product line decisions; branding decisions; pricing strategies; managing marketing channels; wholesaling and retailing.



## **Unit -IV**

Advertising and sales promotion; public relations; personal selling; evaluation and control of marketing effort; web marketing; green marketing.

### **Suggested Readings:**

1. Kotler Philip and Keller; Marketing Management; PHI, New Delhi
2. Kotler, Philip, Kevin Keller, A. Koshy and M. Jha, Marketing Management in South Asian Perspective, Pearson Education, New Delhi
3. Kerin, Hartley, Berkowitz and Rudelius, Marketing, TMH, New Delhi
4. Etzel, Michael J, Marketing: Concepts and Cases, TMH, New Delhi

**22LAW02F3      CONSTITUTIONAL LAW**

	<b>Marks</b>	<b>Credits</b>
<b>L T P</b>	<b>Exam: 100</b>	<b>3</b>
<b>3 - -</b>	<b>Sessional: 50</b>	
	<b>Total: 150</b>	<b>3</b>
	<b>Duration of Exam: 3 hrs.</b>	

**Course Objectives-**

1. To teach Constitutional Law.
2. To Special Provisions for Weaker Sections of the Society.
3. To introduce various Fundamental Freedoms under Art.19.
4. To teach Independence of Judiciary.
5. To improve the logical ability

**Course Outcomes-**

1. Student will be able to Preamble, Definition of State Under (Art-12)..
2. Student will be able to Theory of basic structure of Constitution.
3. Students will be able Judiciary Jurisdiction of Supreme Court.

**UNIT-I**

Preamble, Definition of State Under (Art-12). Rules of Interpretation under (Art-13), Right to Equality (Art.14), Special Provisions for Weaker Sections of the Society, Fundamental Freedoms under Art.19 .

**UNIT-II**

Protection in respect of conviction of offence (Art-20), Right to Life and Personal Liberty (Article 21), Directive Principles of State Policy, Fundamental Duties.

**UNIT-III**

Parliamentary privileges, Judiciary Jurisdiction of Supreme Court and High Court, Independence of Judiciary.

**UNIT-IV**

Amendment of the Constitution,(Article-365), Theory of basic structure of Constitution, Emergency provision,(Article 352-360).

Leading Case: Keshwanand Bharti v State of Kerala, AIR 1975, SC 1461.

## BOOKS RECOMMENDED

1. Kagzi, M.C. Jain. *The Constitutional of India*, (Vol. 1 & 2, New Delhi, India Law House,2001)
2. Pylee, M.V. *Constitutional Amendments in India* (Delhi, Universal Law, 2003)
3. Hasan, Zoya & E. Sridharan. *India's Living Constitution: Ideas, Practices,Controversies* (Delhi, Permanent Black, 2002 ed.)
4. Basu, Durga Das. *Commentary on the Constitution of India*, (Calcutta, DebidasBasu, 1989 Ed.)
5. Seervi, H.M. *Constitutional Law of India* (Vol. I & II, III, Bombay N.M. Tripathi, 1991)
6. Chaube, Shibankinkar. *Constituent Assembly of India* (New Delhi, Wadhwa and Com.Pvt. Ltd. 2002 ed.).

## 22COM02F4

## Basics of E-Commerce

	Marks	Credits
<b>L T P</b>	<b>Exam: 100</b>	<b>3</b>
3 - -	<b>Sessional: 50</b>	
	<b>Total: 150</b>	<b>3</b>
	<b>Duration of Exam: 3 hrs.</b>	

### Course objectives:

1. To learn the Basics of E-Commerce.
2. To learn the mechanisms of Categories of E- Commerce.
3. To learn the mechanisms M-Commerce.
4. To gain knowledge on Payment Technologies for E-Commerce.
5. To know the components and management aspects of failure recovery and fault tolerance.
6. To learn multiprocessor and database operating systems.

### Course Outcomes:

1. Demonstrate understanding of the concepts Customer Relationship Management.
2. Demonstrate understanding The Development of M- Commerce.
3. Demonstrate competence System,Intelligent Card.
4. Students are able to solve Electronic Commerce problem.

### Unit-I

E-Commerce: Meaning, Concept, Definitions, Origin and Development, Categories of E- Commerce: B2B, B2C, B2G, G2G,G2C; The Constitution of the E-Commerce: Portal of the Network, Customer Relationship Management, Supply Chain Management, Logistic Management, Decision Support; Supporting Environment for E-Commerce: Technical Environment, Legal Environment, Credit Environment and Financial Environment.

### Unit-II

M-Commerce: The Origin of M-Commerce, M-Commerce Components, The Development of M-Commerce, The Application of M-Commerce.

### Unit-III

Payment Technologies for E-Commerce: Online Bank, E-Payment Tools: E-Payment System,

Intelligent Card, E-check, E-wallet, E-Cash.

#### **Unit-IV**

Electronic Commerce: Influence on Marketing: Product, Physical Distribution, Price, Promotion, Marketing Communication, Common e-Marketing Tools.

#### **Suggested Readings:**

1. Elias. M. Awad, " Electronic Commerce", Prentice-Hall of India Pvt Ltd.
2. Ravi Kalakota, Andrew B. Whinston, "Electronic Commerce-A Manager's guide", Addison-Wesley.
3. Efraim Turban, Jae Lee, David King, H.Michael Chung, "Electronic Commerce–A Managerial Perspective", Addison-Wesley.
4. Elias M Award, "Electronic Commerce from Vision to Fulfilment", 3rd Edition, PHI, Judy Strauss, Adel El-Ansary, Raymond Frost, "E-Marketing", 3RDEdition, Pearson Education.

## 22CET03C1- TRAFFIC ENGINEERING AND TRAFFIC FLOW THEORY

L- T- P  
4- 0- 0

Exams Marks : 100  
Sessionals Marks : 50  
Total Marks : 150  
Duration of Exam : 3 hrs.

**Course Objectives:** To study essential concepts of traffic sign and signals, road marking ,and other traffic control aids. To understand the design of roads according to the geometric dimensions.

**Course Outcomes:** At the end of the course, students will demonstrate their ability to:

1. Understand the traffic signs, signals, road marking and other traffic control aids.
2. Understand all the technical terms used in the construction of roads.
3. Understand the roads according to the geometric dimensions
4. Understand traffic safety measures.

**NOTE:** Eight questions are to be set from whole syllabus and the students will have to attempt five questions in all.

### UNIT-I

Traffic flow Characteristics, road user characteristics – human factors including reaction time and vehicular characteristics affecting road design and traffic flow.

### UNIT-II

Traffic studies - data collection, analysis and interpretation of results of classified traffic volume, spot speed, speed and delay, origin and destination and parking studies, Sampling in traffic studies. Evaluation of improvement measures by "before and after studies".

### UNIT-III

Traffic flow characteristics, traffic flow variables, speed – flow – density relationship, PCU values, level of service, factors influencing roadway capacity, capacity of roads at various levels of service, capacity of intersections, Spot Speed Data presentation.

### UNIT-IV

Traffic flow theory – scope, relationship between flow variable, bottle necks, Queuing theory and applications; vehicle arrivals, delays at intersections, Elements of simulation technique in traffic Engineering.

### Reference:

1. L.R. Kadiyalli, *Traffic Engineering and Transport Planning*, Khanna Publishers, 7th Edition, 2008.
2. C.A.O'Flaherty, *Transport Planning and Traffic Engineering*, Arnold, 1997.
3. R. P. Roess, E. S. Prassas, & W.R. Mc Shane, *Traffic Engineering*, Prentice Hall, 3rd Edition, 2004
4. May, *Traffic Flow Fundamentals*, Prentice Hall, 1989
5. F. L. Mannering, *Principles of Highway Engineering and Traffic Analysis*,

4th Edition,2008, John Wiley.

## **23CET03C2- TRANSPORTATION AND ENVIRONMENT**

L- T- P  
4- 0- 0

Exams Marks : 100  
Sessionals Marks : 50  
Total Marks : 150  
Duration of Exam : 3 hrs.

**Course Objectives:** To understand the transport related pollution and to maintain the environment and to know about environmental impact assessment

**Course Outcomes:** At the end of the course, students will demonstrate their ability to:

1. Understand transport related pollution and to maintain the environment.
2. Understand environmental impact assessment.
3. Understand vehicle characteristics,driver,road and environment.
4. Understand urban and non urban traffic noise sources.

### **UNIT-I**

The Road Environment: human factors in road user behavior, vehicle characteristics, driver, road and environment. Environmental effects of transport; problems of identification;

### **UNIT-II**

Environmental Impact Assessment: Evaluation of environmental impact due to construction. of new facilities and the effect of traffic thereon due to Bypasses, widening/four laning, expressway; grade separators. Assessment and attenuation. Noise; vibration; air pollution; Air pollution. emission levels, air- pollution dispersion, The box model, noise generation, noise measurement, noise propagation and mitigation strategies, noise measures, mathematical models of transportation noise, energy consumption and related issues.

### UNIT-III

Environmental traffic management. Co-ordinated signal system on urban arterial road intersections to reduce air pollution. Energy related aspects of different transport technologies. Traffic calming, Measures, Road transport related air pollution, sources of air pollution, effects of weather conditions, Vehicular emission parameters, pollution standards, measurement and analysis of vehicular emission; Imitative measures; EIA requirements of Highways projects, Procedure; MOEF World Bank/EC/UK guidelines ; EIA practices in India.

### UNIT-IV

Land consumption and land-use effects; planning blight and compensation; Global climate, energy and resource use; and sustainability, Gol policies and requirements for clearances for Raod projects.

#### **Reference:**

1. K. Wark, C.F. Warner, & W.T. Davis, *Air Pollution: Its Origin and Control*, PrenticeHall. 3rd Ed. 1997.
2. R.W. Boubel, *Fundamentals of Air Pollution*, Academic Press, 4th Ed. 2007.
3. D. Vallero, *Fundamentals of Air Pollution*, Academic Press, 4th Ed. 2007.
4. L. Canter, *Environmental Impact Assessment*, McGraw-Hill International, 2nd Ed.1995.



## 23CET03C3- SEMINAR

L- T- P  
0- 0- 2

Sessionals Marks : 50  
Total Marks :100

Every student will be required to present a seminar talk on a topic approved by the Department except on his/her dissertation & submit the report to the Department. The committee constituted by the Head of the Department will evaluate the presentation and will award the marks.

**NOTE: A Student who is awarded the 'F' grade will be required to repeat the seminar on the same topic.**

## 22CET03C4- DISSERTATION PHASE-I

L- T- P  
0- 0- 2

Sessionals Marks : 0  
Total Marks : 100

Every student will carry out dissertation under the supervision of a Supervisor(s). The topic shall be approved by a Committee constituted by the Head of the concerned Deptt. Every student will be required to present two seminar talks, first at the beginning of the Dissertation (Phase-I) to present the scope of the work and to finalize the topic, and second towards the end of the semester, presenting the work carried out by him/her in the semester. The committee constituted will screen both the presentations so as to award the sessional grades out of A+, A, B, C, D and F. A student scoring 'F' grade shall have to improve this grade before continuing his/her Dissertation in the 4<sup>th</sup> semester failing which he/she shall have to repeat the Dissertation (Phase-I) next time in the regular 3<sup>rd</sup> semester.

## 23CET03CL1- CAD LAB

<b>L</b>	<b>P</b>	<b>Credits</b>	<b>Class Work</b>	<b>50 Marks</b>
	<b>2</b>	<b>2</b>	<b>Examinations</b>	<b>50 Marks</b>
			<b>Duration of Exam</b>	

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### COURSE OBJECTIVES

1. To study various drafting and road design software.
2. To perform road design using software.

### **List of experiments:**

1. Basics of AutoCAD
2. Alignment Design using MXRoad
3. Horizontal Alignment using MXRoad
4. Vertical Alignment using MXRoad
5. L-Section using MXRoad
6. Cross Sections using MXRoad
7. Earthwork calculations using MXRoad
8. Design of pavement using IIT Pave
9. Introduction to GIS software
10. Introduction to Traffic simulation software: VISSIM/VISSUM and other software in Highway Engineering

### **Notes:**

1. Each Laboratory Class/Section shall not be of more than about 20 students.
2. To allow fair opportunity of practical hands-on experience to each student, each experiment may either be done by each student individually or in a group of not more than 3-4 students. Larger groups be strictly discouraged / disallowed.
3. Pre-experimental & post experimental quiz / questions may be offered for each Lab experiment to reinforce & aid comprehension of the experiment.

## 22CET0301-GEO-ENVIRONMENTAL ENGINEERING

L- T- P  
3- 0- 0

Exams Marks : 100  
Sessionals Marks :50  
Total Marks : 150  
Duration of Exam :3hrs.

**Course Outcomes (CO'S):** At the end of the course, the student shall be able to:

CO1 . Analyse saturated flow regime in soil using Darcy and flow equations.

CO2 Simulate infiltration problem in unsaturated flow and analyse difference in behaviour between sand, silt and clay.

CO3 . Design a single or double composite landfill liner satisfying groundwater quality requirements.

CO4 Describe the main processes of clay-water interactions and how they affect behaviour of clay in geo environmental engineering.

**NOTE-** Examiner will set nine question in total. Question one will be compulsory and will comprises of all section and remaining eight questions to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

### UNIT-I

Wastes: source, production and classification of wastes, soil pollution processes, waste characterization.

### UNIT-II

Waste disposal facilities :Landfill sand impoundments, Slurry walls, Types of land fills, Landfill planning and design; Barrier systems– Basic concepts, Design and construction;Stability,compatibilityandperformancecontaminantt ransformationandtransportinsubsurface,

### UNIT-III

Monitoring surface contamination, Stabilization and modification of wastes. Re use of waste materials, contaminated

siteremediation, Case studies in waste handling.

#### **UNIT-IV**

Soil erosion and conservation: Causes of soil erosions, Factors contributing to erosion–climatic factors, Topographical factors, Vegetation factors. Erosion control–Cropping systems, Gullies, Check dams, Contouring, Wind striping, Ridging, Bank protection, Erosion control with vegetation mats and Silt fences.

#### Note:

1. Student is expected to give at least one seminar on the subject from journal.
2. Preparation of paper involving case studies where the topics covered were incorporated in practice.

#### *Text Book*

1. *Geoenvironmental Engineering – principles and applications* by L.N.Reddi and H.F.Inyang, Marcel Dekker, 2000

#### *Reference books*

1. *Geotechnical practice for waste disposal* by D.E.Daniel, Chapman and Hall, London 1993
2. *Clay barrier systems for waste disposal facilities* by R.K.Rowe, R.M.Quigley and J.R.Booker, E&FN Spon, London, 1995
3. *Design, construction and monitoring of landfills* by Bagchi, A, John Wiley & Sons, New York 1994
4. *Waste containment systems, Waste stabilization and landfills Design and evaluation* by H.D.Sharma, H. D. and S.P.Lewis, John Wiley & Sons, New York 1994

## 22CET0303-GEOMETRIC DESIGN OF HIGHWAYS

L- T- P  
3- 0- 0

Exams Marks : 100  
Sessionals Marks :50  
Total Marks : 150  
Duration of Exam :3hrs.

**Course Outcomes (CO'S):** At the end of the course, the student shall be able to:

CO1 . Develop an understanding of the principles of geometric design in the context of transportation planning and traffic design.

CO2 Understand the design criteria for geometric design of highways.

CO3 . Develop the capability to design highways, and utilize the state of the art tools for this process.

**NOTE-** Examiner will set nine question in total. Question one will be compulsory and will comprises of all section and remaining eight questions to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

### UNIT-I

Objects of Geometric design: Design controls

Elements of design: Cross sectional Elements pavement surface Characteristics, Camber,Width of pavements – carriage-way, kerbs, road margins, Formation width, Right of way,Building line, control line. Sight distances – Stopping Sight Distance (SSD), Intermediate Sight Distance (ISD), Headlight Sight Distance (HSD), Overtaking Sight Distance (OSD). (“Geometric Design Standards for Rural (Non – Urban) Highways” – IRC: 73 - 1980) (“Geometric Design Standards for Rural (Urban) Highways” – IRC: 86 - 1983)

### UNIT-II

Horizontal alignment– Super Elevation analysis and design, Extra widening and side friction.Transition curves – types, Calculation of length. (“Guidelines for Design of Horizontal Curves for Highways and design tables” – IRC: 38 -1988)

Vertical alignment – Gradient, Types – Ruling, Limiting, Exceptional and Minimum gradient. Grade compensation. Vertical curves – Types- Summit and valley curve – Lengths. (“Vertical Curves for Highways”, IRC SP 23: 1993)

### UNIT-III

At-grade intersections – sight distance considerations and principles of design, channelization, mini round-abouts, layout of round-abouts.

Advantages and limitations of roundabouts. (Guidelines for the design of at-grade Intersections in Rural and Urban Areas”, IRC SP41: 1994)

Rotary Intersections: Definitions – Diverging, Merging, Weaving, Weaving Length, Advantages and Disadvantages. Rotary Design Elements – Design Speed, Radius at Entry, Radius at Exit, Width of Rotary Carriage way, Entry and Exit angles, External kerb line, Super elevation and camber. Capacity of rotary (“Recommended practice for Traffic Rotaries”, IRC: 65 – 1976).

#### **UNIT-IV**

Interchanges – Advantages and Disadvantages, Major and minor interchanges, entrance and exit ramps, acceleration and deceleration lanes, bicycle and pedestrian facility design. (“Guidelines for the design of Interchanges in Urban area”, IRC 92:1985)

Parking layout and design. Terminal layout and design. (“Tentative Recommendation on the Provision of Parking Space for Urban Areas”, IRC SP12: 1973)

#### *Text Books*

1. *Highway Engineering, S.K. Khanna and C.E.G Justo and A. Veeraragavan, Nemchand Brothers publications.*
2. *Khisty, C. J., and Lall, B. K., Transportation Engineering: An Introduction, PrenticeHall International, Inc.,2002.*

## SEMESTER-IV

### **23CET04C1 -DISSERTATION & VIVA (Phase II)**

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Exams Marks : 500

Sessionals Marks : 250

Total Marks : 750

Duration of Exam : 3hrs.

The Dissertation Phase-1 will be continued as dissertation in 4<sup>th</sup> Semester. The award of sessional grades out of A+, A, B, C, D and F will be done by an internal Committee constituted by the Head of the Deptt. This assessment shall be based on presentation (s), report, etc. before this committee. In case a student scores 'F' –grade in the sessional, failing which he/ she will not be allowed to submit the dissertation. At the end of the semester, every student will be required to submit three bound copies of his/her Master's dissertation of the office of the concerned Department. Out of these, one copy will be kept for department record & one copy shall be for the supervisor.

A copy of the dissertation will be sent to the external examiner by mail by the concerned department, after his/her appointment and intimation from the university. Dissertation will be evaluated by a committee of examiners consisting of the Head of the Department, dissertation supervisor(s) and one external examiner. There shall be no requirement of a separate evaluation report on the Master Dissertation from the external examiner. The external examiner shall be appointed by the University from a panel of examiners submitted by the respective Head of Deptt., to the Chairman, Board of Studies. In case the external examiner so appointed by the University does not turn up, the Director/ Principal of the concerned college, on the recommendation of the concerned Head of the Deptt. Shall be authorized, on behalf of the University., to appointed an external examiner from some other institution. The student will defend his/her dissertation through presentation before this committee and the committee will award one of the grades out of A+, A, B, C, D and F. Student scoring 'F' grade in the exam shall have to resubmit his /her Dissertation after making all correction / improvements and this dissertation shall be evaluated as above.

**Note: The Scheme of awarding the Grades to the student in the course will be supplied by the University to the examiner(s).**