स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ

नांदेड– ४३१६०६ (महाराष्ट्र)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY

NANDED-431606, MAHARASHTRA STATE, INDIA.

Established on 17th September 1994 - Recognized by the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'A' Grade

ACADEMIC (I-BOARD OF STUDIES) SECTION

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अभियांत्रिकी विद्याशाखेतील पदवी तृतीय वर्षाच्या अभ्यासक्रमांचे Course Structure शैक्षणिक वर्ष २०१६–१७ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, प्रस्तुत विद्यापीठाच्या अभियांत्रिकी विद्याशाखेतील खालील पदवी तृतीय वर्षाच्या (CGPA) अभियांत्रिकी शाखांच्या अभ्यासक्रमांचे **Course Structure** शैक्षणिक वर्ष २०१६–१७ पासून लागू करण्यात येत आहे.

(1) Mechanical Engineering
(2) Computer Science & Engineering
(3) Electronics & Telecommunication Engineering
(4) Civil Engineering
(5) Information & Technology
(6) Electrical Engineering

सदरील Course Structure व परिपत्रक प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी.

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.: शैक्षणिक–०१/परिपत्रक/अभियांत्रिकी–कोर्स स्ट्रक्चर/२०१६–१७/९६८
दिनांक : १९.०८.२०१६.

संचालक
महाविद्यालय व विद्यापीठ विकास मंडळ

प्रत माहिती व पुढील कार्यवाहीस्तव :

१) मा. कुलसचिव यांचे कार्यालय, प्रस्तुत विद्यापीठ.
२) मा. परीक्षा नियंत्रक यांचे कार्यालय, प्रस्तुत विद्यापीठ.
३) प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
४) उपकुलसचिव, पदव्युत्तर विभाग, प्रस्तुत विद्यापीठ.
५) साहाय्यक कुलसचिव, पात्रता विभाग, प्रस्तुत विद्यापीठ.
६) सिस्टम एक्सपर्ट, यू.जी.सी. कक्ष, प्रस्तुत विद्यापीठ.

Swami Ramanand Teerth Marathwada University, Nanded
SCHEME AND DETAIL SYLLABUS OF T.E. CIVIL

Teaching and Evaluation Scheme for

Third Year Program in Civil Engineering

Effective from 2016-17

Semester V

Course Code	Name of Subject	Teaching Scheme			Credit Structure		
		L	T	P	T	P	Total
CE301	Engineering Geology	04		02	03	01	04
CE302	Geotechnical Engineering-I	04		02	03	01	04
CE303	Theory of Structure -II	04			04		04
CE304	Design of Structure-I (Steel) LSM	04		02	04	02	06
CE305	Transportation Engineering-I	04		02	03	01	04
	Total	20		08	17	05	22

Semester VI

Course Code	Name of Subject	Teaching Scheme			Credit Structure		
		L	T	P	T	P	Total
CE306	Geotechnical Engineering-II	04			03		03
CE307	Environmental Engineering-I	04		02	03	01	04
CE308	Design of Structure-II (RCC) LSM	04		02	04	02	06
CE309	Transportation Engineering-II	04			03		03
CE310	Water Resources Engineering -I	04			03		03
CE311	Elective -I	04		02	03	02	05
	Total	24		06	19	05	24

Elective-I

CE311 a) Infrastructure Engineering.
CE311 b) Solid Waste Management.
CE311 c) Advanced Structural Analysis.
CE311 d) Advanced Concrete Technology.

Evaluation Scheme			
Theory Credit Course		Practical	
MSE	ESE	MSE	ESE
20	80	30	70
Minimum for passing in theory and practical 40% each MSE: Mid Semester Exam ESE: End Semester Exam			

Total Credit of TE Civil : 46

BOS Members (Ad Hoc) : Civil Engineering **Dean Engineering**

CE 301 Engineering Geology

Teaching Scheme:	**Examination Scheme:**	**Credit structure:**
Lectures: 4 hours per week	Theory Paper: 80 marks	Theory: 03
	MSE: 20 marks	Practical: 01

Course Educational Objectives:
To Understand the importance of geology has also been recognised in field of Civil Engineering projects such as water supply, construction of dam, reservoir, tunnels, bridges etc. Require geological advice

SECTION- A

Unit –1 :Mineralogy ,Petrology and General Geology .

a) Introduction to the subject , object , scope and sub divisions: Introduction to mineralogy , rock forming minerals and their properties , primary and secondary minerals , felsic and mafic minerals , essentials and accessory minerals. (02 hours)

b) Introduction to petrology : Main divisions of rocks .Igneous rocks ; mineral composition , textures , reasons of textural variation , textures of plutonic , hypabyssal and volcanic rocks . Classification of igneous rocks , study of common rock types prescribed in practical work and their engineering applications. (03 hours)

c) Secondary Rocks:Rock weathering ,decomposition and disintegration classification and grain size classification ,textures of secondary rocks , features of shallow water depositions , study of common rock and engineering applications. (02 hours)

d) Metamorphic rocks :Agents and types of metamorphism ,metamorphic textures and structures , study of common rock types prescribed in practical work and their engineering applications. Rock cycle . (2 hours)

Unit-2 Structural Geology and Plate Tectonics .

a) Structural geology :Out crop , dip and strike , conformable series , unconformity and over lap ,faults and their types , fold and their types , inliers and outlier . (5 hours)

b) Structures : Structural features resulted due to igneous intrusions , concordant and discordant igneous Intrusions , joints and their types , stratification and lamination. (03 hours)

c) Mountain building activity and introduction to plate tectonics . (1 hour)

Unit-3 Geomorphology and Historical Geology .

a) Geomorphology :Geological action of river , Coastal Geology . (03 hours)

b) Historical Geology :General principles of Stratigraphy , geological time scale , physiographic division of India , significance of their structural characters in major civil engineering activities . (03 hours)

SECTION –B

Unit-4 :Preliminary Geology Studies and Remote Sensing

a) Preliminary Geological Explorations : Surface survey , reconnaissance survey, subsurface survey , drill holes ,preservation of cores , Compilation and interpretation of

information obtained from these , comparative reliability of data obtained by drilling and excavation. (04 hours)

b) Correlation of surface data with results of subsurface exploration , limitations of drilling , engineering significance of geological structures i.e.stratification , dips, folds, faults , joints,fractures , crush zones , fault zones ,dykes and case studies (04 hours)

c) Remote sensing and geographical information system , application of remote sensing and geographical information system in Civil Engineering . (02 hours)

Unit-5 :Role of Engineering Geology in Reservoirs , Dams and Tunnelling .

a) Geology of Dam Site :Strength ,stability and water tightness of foundation rocks ,influence of geological conditions on the choice and type of dam , preliminary geological work on dam sites ,precaution to be taken to counteract unsuitable conditions like leaky rocks ,faults ,dykes, crush zones, joints fractures , unfavourable dips etc and their treatments, case studies. (03 hours)

b) Geology of reservoir sites : Physical properties and structure of rocks, geological conditions suitable and unsuitable for reservoir sites , conditions likely to cause leakage through reservoir rims ,importance of ground water studies and effects of rising of the water table and case studies . (02 hours)

c) Tunnelling : Preliminary geological investigations for tunnels , important geological considerations while choosing alignment , difficulties during tunnelling as related with lithology, nature and structure of material to be excavated , role of groundwater , geological conditions likely to be troublesome , suitability of common rock types for excavation and tunnelling , unlined tunnels and case studies. (03 hours)

Unit-6 Geological Hazards , Ground Water and Building Stones .

a) Geological Hazards :Volcanism , Earthquakes & Seismic zones of India , Landslides and stability of hill slopes , its causes , role of water , stability of slopes in consolidated material , influence of dip and slope, safe and unsafe slopes , prevention of landslides keeping slopes free from water , retaining walls ,vegetation , slope treatment , precautions to be taken while aligning roads along the slopes and case studies . (02 hours)

b) Groundwater : Types of ground water , water table and depth zones , relation between surface relief and water table , influence of hydrological properties of rocks geological work of groundwater , effects of solution and deposition , geological conditions favourable for natural springs and seepages , depression and contact springs , hot springs and geysers , wells and drill holes , fluctuations in water table levels effects of dams and canals , effects of pumping cone of depression , circle of influence , conservation of ground water ,artesian wells and geological conditions , water bearing capacity of common rocks. (02 hours)

c) Building Stones : Requirements of good building stone , strength durability ,case of dressing and appearance on mineral compositions , textures and field structures , suitability of common rocks as building stone . (02 hours)

Course outcomes

As a students in the Bachelor of Engineering (Civil Engineering) will undertake advance courses in geology Such as Rock mechanics, Geoinformatics to study the geology And select the suitability of site for different Construction Development work.

Text Books :

1. Text Book of Engineering Geology by R.B.Gupte 2001 ,P.V.G.Publication , Pune .
2. Engineering Geology- Subinoy Gangopadhyay –Oxford University Press.
3. A Text Book of Engineering Geology By N.Chenna Kesavulu.2010 ,McMillan India Ltd.

Reference Books :

1. Principles of Engineering Geology by S.K.Garg ,1999, Khanna Pub.New Delhi
2. Principles of Engineering Geology by D.Venkat Reddy 2010 Vikas Publishers
3. Geology and Engineering by K.V.G.K.Gokhale .
4. Geology of India and Burma By m.S.Krishnan ,1982 CBS Publishers, New Delhi.
5. Physical Geology by Arthur Holmes –ELBS Publication.
6. Structural Geology by M.P.Billings .
7. Principles of Engineering Geology and Geotechniques –D.P.Krynine & W.R.Judd , CBS Publishers New Delhi .
8. Engineering Geology by FGH BIyth and De Frietus ,2006 ,Reed Elsevier India Ltd.
9. Engineering Geology by Bell.

CE 302 GEOTECHNICAL ENGINEERING - I

Teaching Scheme: structure:	**Examination Scheme:**	**Credit**
Lectures: 4 hours per week	Theory Paper: 80 marks MSE: 20 marks	Theory: 03 Practical: 01

COURSE OBJECTIVE:

To get the knowledge of soil structure, different properties and how to improve the soil properties for engineering purpose.

Section-A

UNIT 1: ELEMENTARY PROPERTIES

Origin, formation of soil, transportation of soil , General types of soils, soil structure- single grained, flocculent , dispersed and Honeycomb, size , shape, specific surfaces, inter particle forces in soil mass, structure of clay minerals, Influence of clay minerals on engineering behavior.

Phase Diagram, specific gravity, Void ratio, Porosity, Degree Of Saturation, Percentage Air Voids, Air content, Moisture content , Weight relationship, Volume relationship, problems. (08 hrs.)

UNIT 2:

A) INDEX PROPERTIES OF SOILS:

Water content, Specific gravity, particle size distribution(Sieve analysis, Sedimentation analysis theory by Hydrometer method) , particle size distributions curve & its use, relative density of cohesion less soils, consistency of soils, Determinations of liquid limit, plastic limit, shrinkage limit & plasticity index Determinations of in situ density , voids ratio and density index problems, sensitivity and thixotropy.

B) CLASSIFICATION OF SOILS:

Purpose of Soil classification, classification of soil- Particle size, Textural, HRB, Unified and IS Classification, Field Identification of Soils. (08 hrs.)

UNIT 3 : SOIL HYDRAULICS

One dimensional Flow-Darcy's law, discharge velocity & seepage velocity, validity of Darcy's law, laboratory methods of permeability determination, factors affecting permeability, permeability of stratified soil masses, problems. (04 hrs.)

Section-B

UNIT 4. : CONSOLIDATION:

Initial, Primary & Secondary Consolidation, Spring Analogy ,Terzaghi's one dimensional consolidation theory ,Degree of Consolidation , co-efficient of compressibility , co-efficient of volume change, co-efficient of consolidation, compression index, determining co-efficient of consolidation ,factors affecting compressibility, Normally consolidated and over consolidated clay, pre consolidation pressure and its determination, Laboratory consolidation tests. (07 hrs)

UNIT 5 : COMPACTION:

Introduction, standard proctor test, zero air void line, modified Procter test, field compaction method, , placement water control, factors affecting compaction, effect of compaction on properties of soils, suitability of methods of compaction, comparison of compaction and consolidation. (06 hrs)

UNIT 6: SHEAR STRENGTH OF SOILS:

Concept of shear strength, Mohr's stress circle, Mohr's coulomb theory, the effective stress principle, shear strength measurement: direct shear test, triaxial compression test, unconfined compression test, vane shear test, factor affecting shear strength of soils. (07 hrs)

COURSE OUTCOME:

To classify soils and know how water with soil affecting also get the idea about the shear strength parameters of soil.

REFERENCE BOOKS:

1.Soil Engineering in theory and Practice – Alam Singh and Chowdhary G.R.

2.Soil Mechanics and Foundation Engineering- K.R.Arora.

3.Soil Mechanics and Foundation Engineering – Punmia B.C.

4.Soil Mechanics and Foundation Engineering – V.N.S Murthy.

5.Geotechnical Engineering – C. Venkatramaiah.

6.Geotechnical Engineering- S.K.Gulati & Manoj Datta.

7.Geotechnical Engineering – Purushothama Raj.

8.Basic and Applied Soil Mechanics – Gopal Rajan & ASR Rao.

CE 303 THEORY OF STRUCTURES - II

Teaching Scheme:	**Examination Scheme:**	**Credit structure:**
Lectures: 4 hours per week	Theory Paper: 80 marks MSE: 20 marks	Theory: 04

Course Objectives:-

1. To introduce the students to basic theory and concepts of structural analysis and the classical methods for the analysis of buildings.
2. To introduce the students to advanced methods of analysis like matrix methods of the structures.

Unit I: (10 hours)

a) Basic Theorems of structural Mechanics, Maxwell's reciprocal theorems, Muller Breslau's Principle, Applications of these theorems (03 hours)

b) Slope-deflection method of analysis: Slope-deflection equations, equilibrium equation of slope-deflection method, application to beams with and without joint translation and rotation, yielding of support, application to non-sway rigid jointed rectangular portal frames, shear force and bending moment diagram. (07 hours)

Unit II (07 hours)

a) Moment distribution method of analysis:

Stiffness factor, carry over factor, distribution factor, application to beams with and without joint translation and yielding of support, application to non-sway rigid jointed rectangular portal frames, shear force and bending moment diagram.

b) Sway analysis of rigid jointed rectangular single bay single storey portal frames using moment distribution method (Involving not more than three unknowns).

Unit III (05 hours)

Fundamental concepts of flexibility method of analysis, formulation of flexibility matrix, Application of flexibility method to beams (Involving not more than three unknowns).

Unit IV (05 hours)

Fundamental concepts of stiffness method of analysis, formulation of stiffness matrix, Application to beams by structure approach only, (Involving not more than three unknowns).

Unit V (07 hours)

Analysis of beams and frames by Kani's method.

Unit VI **(06 hours)**

Plastic analysis of structure.

a) True and idealized stress-strain curve for mild steel in tension, stress distribution in elastic, elasto-plastic and plastic stage, concept of plastic hinge and collapse mechanism, statical and kinematical method of analysis, upper, lower bound and uniqueness theorem.

b) Plastic analysis of determinate and indeterminate beams, single bay single storied portal frame.

Course Outcomes: -

The student will have the knowledge on advanced methods of analysis of structures.

TEXT BOOKS:

1. Theory of Structures - Punmia.B.C., Ashok Kumar Jain and Arun Kumar Jain- Laxmi Publications, 2004.

2. Comprehensive structural Analysis – Vol. I & II -Vaidyanathan, R. and Perumal, P- Laxmi Publications, New Delhi, 2003

3. Structural Analysis - Negi L.S. & Jangid R.S- Tata McGraw Hill Publications, New Delhi, 2003.

4. Structural Analysis – Vol. 1 Vol. 2- BhavaiKatti, S.S- Vikas Publishing House Pvt. Ltd., New Delhi, 2008

5. Theory of Structures - S. Ramamurtham-Dhanapat Rai Publishing Compony.

REFERENCES:

1..Structural Analysis—Deodas Menon—Narosa Publishing House

2. Structural Analysis--- Thandavamoorthy----Oxford University Press

3. Structural Analysis: A Matrix Approach by Pundit and Gupta, McGraw Hills.

4.Structural Analysis by Hibbler, Pearson Education.

5.. Strctural Analysis-M.M.Das,B.M.Das—PHI Learning Pvt Ltd.Delhi

6.Fundamentals of Structural Analysis, 2ed—West--Wiley

7.Theory of Structures Vol. I & II by B. C. Punmia, Laxmi Publication.

8. Theory of Structures Vol. I & II by Perumull & Vaidyanathan, Laxmi Publication.

9. Fundamentals of Structural Analysis: K.M.Leet,Vang,Gilbert-- McGraw Hills

10.Matrix Methods for structural engineering.by Gere ,Weaver.

12 Introduction to Finite element method, Dr. P.N. Godbole, New Age Publication, Delhi

13. Finite element Analysis, S.S. Bhavikatti, New Age Publication, Delhi

14 Basic Structural Analysis: Wilbur And Norris.

CE 304 DESIGN OF STRUCTURES-I (Steel) LSM

Teaching Scheme:	**Examination Scheme:**	**Credit structure:**
Lectures: 4 hours per week	Theory Paper: 80 marks	Theory: 04
	MSE: 20 marks	Practical: 02

OBJECTIVE:

This course covers the design of structural steel members subjected to compressive, tensile and bending loads, as per current codal provisions (IS 800 - 2007) including connections. Design of structural systems such as roof trusses, gantry girders is included.

UNIT I

INTRODUCTION

Introduction to Design of steel structures, Design Philosophy, comparison of LSM & WSM, advantages and disadvantages of steel structures, types of steel structures, grades of structural steel, various rolled steel sections, loads and load combinations partial safety factors for load and materials, load calculation for roof trusses. Types of bolts & welds, analysis and Design of axially and eccentrically loaded bolted and welded connections (subjected to bending and torsion). (09)

UNIT II

TENSION MEMBERS:

Common sections, Net area, modes of failure, load carrying capacity, Design of axially loaded tension members, Design of end connections (Bolted and welded). (05)

UNIT III

COMPRESSIONMEMBERS:

Common sections, economical sections, effective length, slenderness ratio, modes of failure, classification of cross section, behavior of compression member, load carrying capacity, Design of compression members.

Design of column subjected to axial and eccentric loading, design of lacing, battening system. Design of slab bases & gusseted base subjected to axial and eccentric load. (09)

UNIT IV

BEAMS

Types of sections, behavior of beam in flexure, design of laterally supported, unsupported beams and built up beam using flange plates, curtailment of flange plates, check for deflection, shear, web buckling & web crippling.

Forces acting on gantry girder, commonly used sections, design of gantry girder as laterally unsupported beam, connection details (09)

UNIT V

ROOF TRUSSES

Roof trusses, Design loads, design of purlin and elements of truss, end bearing, Design of gantry girder (09)

UNIT VI

Design of welded Plate Girder. (05)

TEXT BOOKS:

1. Dayaratnam, P., "Design of Steel Structures", Second edition, S. Chand & Company, 2003.

2. Ramachandra, S. and Virendra Gehlot, "Design of Steel Structures – Vol. I & II", Standard Publication, New Delhi, 2007

REFERENCES:

1. "Teaching Resources for Structural Steel Design – Vol. I & II", INSDAG, Kolkatta.

2. Gaylord, E.H., Gaylord, N.C., and Stallmeyer, J.E., "Design of Steel Structures", 3rd edition, McGraw-Hill Publications, 1992

3. Negi L.S.. Design of Steel Structures, Tata McGraw Hill Publishing Pvt Ltd, New Delhi, 2007.

4. IS 800-2007 Indian Standard General Const

CE 305 Transportation Engineering-I

(Highway Engineering, Traffic Engineering and Bridge Engineering)

Teaching Scheme:	**Examination Scheme:**	**Credit structure:**
Lectures: 4 hours per week	Theory Paper: 80 marks	Theory: 03
	MSE: 20 marks	Practical: 01

Course objectives:

1. To study the principles of Highway geometrics design as per IRC standards.
2. To learn different types of pavements, components and function of pavements.
3. To give an overview about failure and maintenance of highways
4. To study the various Methods for pavement construction &materials required for pavement construction
5. To give basic information about pavement design.
6. To understand the concept of traffic planning, operation and control.
7. To study the fundamental concepts of Bridge Engineering including sites election for bridge, various components of Bridge structures.

(Section –A)

UNIT – 1. Highway Planning

1.1 Introduction

Importance of Transportation Engineering, Highway development in India (Jayakar committee, central road fund, Indian road congress, Central Road Research Institute, Twenty year plans),Classification of Roads, Expressway, Present status of roads in India. **(3Hrs.)**

1.2 Highway alignment

Basic requirement of ideal alignment, factors controlling alignment, highway alignment in hilly areas **(2Hrs.)**

UNIT – 2. Highway Geometric Design

2.1 Introduction

Importance of Geometric design, Factors which control the geometric elements

2.2 Highway Cross section Elements

Pavement surface characteristics (Friction & pavement unevenness), Camber(objective, different types of camber, IRC Recommended values & numerical), width of Pavement or Carriageway, Traffic separators or Medians, Kerbs (objective, different types of kerbs), Road margins, Right of way, Typical cross section of roads. **(2 Hrs.)**

2.3 Sight Distance

Objective, Types of Sight Distance, Stopping Sight distance (SSD), PIEV Theory, analysis of Stopping Sight distance, stopping sight distance at slopes, Examples on SSD& SSD at slopes, Overtaking sight distance (OSD), analysis of overtaking sight distance, overtaking zone, Examples on OSD& overtaking zone, Intermediate sight distance, sight distance at intersections. **(3 Hrs.)**

2.4 Horizontal Alignment

Design speed, horizontal curve, Superelevation, Analysis of Superelevation, maximum & minimum superelevation, Superelevation design with examples, Radius of horizontal curve, Widening of pavement on horizontal curve with examples, object of providing Horizontal object of providing Transition curves (calculation of length of Transition curves & examples are not included in the syllabus), Curve Resistance. **(4 Hrs.)**

2.5 Vertical alignment

Gradient, Types of Gradient, objective& factors considers for providing of providing summit curve and valley curve, (Summit & Valley curve's analysis and their examples are not included in the syllabus), Compensation in gradients on horizontal curve (**2 Hrs.)**

UNIT – 3. Highway Failure, Maintenance and Highway Drainage

3.**1 Pavement failure**

General causes of pavement failures, Failure of sub base, factors for failure of bituminous wearing course, typical failure of flexible pavement, Failure of cement concrete road.**(2 Hrs.)**

3.2 Highway Maintenance & Drainage

Need of highway maintenance, Factors affecting maintenance, Classification of maintenance activities, Maintenance operations, Renewal of surface, Maintenance of bituminous surface, Surface treatment, Special Repair in flexible pavement- waves and corrugations, Remedial measures, Maintenance of cement concrete roads, strengthening of existing pavements (objective and types of overlays).Necessity of road Drainage, Requirement of drainage system. (**3 Hrs.)**

Section –B

UNIT – 4. Pavement Design& Pavements Construction

4.1 Introduction to Pavement Design

Objects road pavements, Requirement of a good road pavements, Factors to be consider for pavement design, Types of Road pavement. (**1 Hr.)**

4.2 Flexible Pavement Design

Flexible pavements, Types of Flexible Pavements, Typical layers of Flexible pavement, Functions of Flexible pavement components, Equivalent single wheel load, G. I. Method for flexible pavement design (G. I. Method examples are not included in the syllabus) **(3 Hrs.)**

4.3Rigid Pavement Design

Rigid pavements, Types of Rigid Pavements, Failure criteria of rigid pavements, comparative study of Flexible & Rigid pavement. Rigid pavement analysis using Westergaard's stress equation with examples. **(2 Hrs.)**

4.4 Construction of Bituminous Pavement

Materials required for bituminous pavement, bituminous surface treatment- prime coat, tack coat, seal coat, colour coat, non-skid coat. Construction procedure for Bituminous Macadam, Construction procedure for bituminous concrete. **(3 Hrs.)**

4.5 Construction of Cement concrete pavement

Methods for construction of cement concrete pavement- (cement grout method, rolled concrete layer method, cement concrete slab method), Construction of joints in cement concrete pavement(expansion joints, construction joint, warping joints), longitudinal joints, joint filler, Joint sealer and Joint sealer. **(3 Hrs.)**

Unit – 5. Traffic Engineering

Definition, objective and necessity of Traffic engineering, various of types Traffic surveys(Accident survey, O-D Survey parking survey, spot speed survey, speed and delay survey, Traffic volume survey),Parking and method of parking, traffic congestion, Traffic control, Traffic control devices-(Signs, Signal, marking and speed breakers) **(5 Hrs.)**

Unit- 6. Bridge Engineering

Basic definitions, Importance of bridge, selection of site for bridge construction, Requirement of ideal bridge, Collection of data, Components parts of a bridge- (Abutments and function of abutment, Pier, wing wall).Bearing- Function of bearing, Requirement of an ideal bearing. Foundation – Well foundation, Caisson Foundation. **(5 Hrs.)**

Course Outcome :

On successful completion of the course, the students shall be able to understand the following

1. Basic concept about Highway Engineering
2. To understand the principles of Highway geometrics design as per IRC standards
3. Perform geometric design for the Highway& Basic concept of Pavement design
4. To understand Types of pavements & Materials required for highway construction.
5. To understand Construction procedure for different type of pavements.
6. To understand maintenance procedure for different type of pavements.
7. To understand the Traffic engineering& different types of traffic control device.
8. Basic idea about the Bridge engineering & Components parts of a bridge.

Reference Books:

1. Highway engineering – S.K. Khanna and C.E.G. Justo, Nem Chand and Brothers, Roorkee (Uttaranchal)
2. Highway and Bridge Engineering by B.L. Gupta & Amit Gupta , Standard Publishers, Distributors ,Delhi
3. Highway Engineering By Dr. S. K. Sharma , S. Chand & Company, New Delhi
4. Highway Engineering – Rangwala, Charotar publishing House, Anand 388001
5. Principles of Transportation Engineering – G.V. Rao Tata MacGraw Hill Publication
6. Traffic Engineering & Transport Planning, By L. R. Kadiyali, Khanna publisher, Delhi
7. Principles and Practices of Bridge Engineering, By S. P. Bindra, Dhanapat Rai Publications
8. "Design of Bridge Structures", By Jagadeesh .T.R. and Jayaram.M.A. ,Prentice Hall of India Pvt. Ltd, Learning Pvt. Ltd., 2013
9. Bridge engineering – Rangwala, Charotar Publishing House, Anand –388 001 (Gujarat)

CE 301 Engineering Geology

(Laboratory)

Teaching Scheme
Practical: 2 hrs/week

Examination Scheme
Practical Examination: 70 marks
Term Work: 30 marks

Following 8 experiments / assignments are to be compulsorily performed . Term work shall consist of journal giving details of the experiments performed in the laboratory

1. Megascopic identification of following mineral specimens (around 50)
Rock Crystal, Rose Quartz, Transparant Quartz , Milky Quartz , Smoky Quartz , Amethyst ,Chalcedoney , different varieties of Agate Jasper Banded Hematite Jasper , Orthoclase , Microcline , Plagioclase , Muscovite , Biotite , Olivine , Apophyllite,Stilbite , different varieties of Calcite ,Gypsum Tourmaline ,Chromite , Limonite , Asbestos , Laterite , Kyanite , Graphite , Haematite , Pyrite, Hornblende , Diopside , Hypersthene , Micaceous Haematite , Garnet .

2. Megascopic identification of following different rock specimens (around 50)Hbl.Muscovite ,Granite , Granite porphyry, Hornblende Granite , Syenite , Syenite porphyry , Diorite ,Epidiorite,Gabbro,Pegmatite,Picrite ,Graphic Granite, Tourmaline Pegmatite ,Dolerite,Rhyolite , Andesite , Pumice ,Trachyte , Compact Basalt , HT.altered A.b.,Giant phenocryst Basalt (GPB) Amygdaloidal Basalt , Pipe A.B,Volcanic Breccia ,Tuff breccias , Laterite ,Bauxite ,Conglomerate , Secondary Breccia ,Sandstone (Red),sandstone with Ripple marks ,Sand stone (White) ,Sandstone (weathered) Sandstone (Micaceous), Sandstone (Motteled) ,Sandstone (Current Bedding), Shahabad Limestone , Red Limestone ,Black Limestone Stalactite Limestone ,Oolitic limestone ,Shelly Limestone,Chert Breccia , Secondary Quartzite , Mudstone , Kyanite Quartzite Grit,Arkose sandstone shale(white) shale (Yellow) shale(Black) Marble ,Serpentine Marble ,Phyllite ,Slate ,Augen,Gneisse ,Hornblende Biotite Gneisse ,Hornblende Gneisse , Mica Schist ,Biotite Schist with Garnet, Muscovite Schist, Chlorite Schist with Magnetite ,Hornblende Schist ,Chlorite Schist ,Talc Schist ,Talc Chlorite Schist ,Talc Mica Schist ,Tale Actinolite Schist ,Quartz sericite ,Schist ,Graphite Schist ,Khondalite ,Charnockite ,Amphibolite.

3. Interpretation and construction of geological sections from contoured geological maps (Total 8)

CE 302 GEOTECHNICAL ENGINEERING – I

(Laboratory)

Teaching Scheme
Practical: 2 hrs/week

Examination Scheme
Practical Examination: 70 marks
Term Work: 30 marks

TERM WORK:

The term work shall consist of a record of laboratory experiments of any ten (10) from the following.

1. Determination of Specific Gravity by Pychnometer.

2. Determination of particle size distribution curve.

3 Determination of Liquid limit

4 Determination of plastic limit

5 Determination of shrinkage limit

6 Field density determinations by Core cutter method.

7 Field density determinations by Sand replacement method

8. Determination of coefficient of Permeability by constant head method

9 Determination of coefficient of Permeability by variable head method

10 Direct shear test.

11 Unconfined compression test.

12 Standard proctor compaction test.

PRACTICAL / ORAL EXAMINATION

The Practical / Oral examination is based on the term work mentioned above.

CE 304 DESIGN OF STEEL STRUCTURES-I (Steel) LSM

(Laboratory)

Teaching Scheme
Practical: 2 hrs/week

Examination Scheme
Practical Examination: 70 marks
Term Work: 30 marks

Term work:

Term work consists of the following.

A) Four numbers of half imperial size sheets showing structural detailing based on syllabus. (Minimum 16 sketches)

B) Design of roof truss including, purlin, bracings, column, column base

And connections design.

C) Design of welded plate girder, design of cross section, curtailment of flange plates, stiffeners and connections.

D) Two site visits: Report should contain structural

Details with sketches. Four half Imperial size drawing sheet out of which one drawing sheet shall be drawn by using any drafting software

.

Oral Examination shall be based on the above term work.

CE 305 Transportation Engineering-I

(Laboratory)

Teaching Scheme
Practical: 2 hrs/week

Examination Scheme
Practical Examination: 70 marks
Term Work: 30 marks

Objectives for Transportation Lab:

To learn the procedures of testing Highway materials (Aggregate & Bitumen) and to get hands on experience by conducting the tests.

Term work: Term work will consist of

A) List of practical: In order to decide the suitability of the aggregate and bitumen for use in pavement construction. The term work based on practical shall consist (at least seven) of the following experiments:

1. Impact test on aggregate.
2. Crushing strength test on aggregate.
3. Abrasion Test on aggregate.
4. Soundness test on aggregate.
5. Shape test on aggregate.
6. Penetration test on bitumen.
7. Flash and Fire point test on bitumen.
8. Ductility test on bitumen.
9. Softening Point test on bitumen.
10. Viscosity test on bitumen.

Minimum Practical 7 out of 10 to be conducted and reported as Term Work.

B) Assignments

Term work shall consists of assignments based on above syllabus. At least 6 (six) Assignments which will include of numerical problems, theory questions, and sketches covering the entire syllabus divided properly unit wise.

Practical examination:

It consists of oral examination based on the above Term work.

CE 306 GEOTECHNICAL ENGINEERING - II

Teaching Scheme:	**Examination Scheme:**	**Credit structure:**
Lectures: 4 hours per week	Theory Paper: 80 marks MSE: 20 marks	Theory: 03

COURSE OBJECTIVE:

To get the knowledge of classical theories of earth pressure & stress distribution, also how to improve the soil for stability of structure, various techniques with which we will know how to improve weak soil by grouting or geosynthetics.

SECTION-A

UNIT 1: SEEPAGE ANALYSIS:

Seepage pressure, Quick sand condition,2-Dimensional Laplace equation, Properties and Construction of Flow Net & its usaes Construction of Phreatic line in earth dam, Phreatic line in earth dam with horizontal filter, Phreatic line in earth dam with no filter, Flow through zoned earth dam, piping mechanism. (6 hrs.)

UNIT 2: DRAINAGE & GROUND MODIFICATION

Ditches and sumps, well point system- Single stage & multiple stages, shallow & deep well drainage, vacuum method, electro-osmosis method, protective filters.

Objects of ground modification, classification-Mechanical, chemical, by use of admixtures, in-situ ground improvement, modification by grouting- Types of grouts, Desirable characteristics, Grouting Pressure, Grouting methods, grouting arrangement. (8 hrs.)

UNIT 3: STRESS DISTRIBUTION IN SOIL:

Stresses due to self Weight, Boussinesq analysis for point load, vertical pressure under uniformly loaded circular area & rectangular area, vertical pressure due to line load & strip load, pressure isobar, Equivalent point load method, preparation & use of Newmark's influence chart, contact pressure. (6 hrs.)

SECTION-B

UNIT 4. LATERAL EARTH PRESSURE THEORIES

Introduction, types of earth pressure (At rest , active, passive), Rankine's earth pressure theory: Active earth pressure; Passive Earth pressure for horizontal & inclined backfill for cohesive & Cohesionless soils, Coulomb's Wedge Theory: Active earth pressure; Passive Earth pressure conditions (No Proof), Graphical Methods: Rebhann's construction for active pressure, Culmann's Method for active condition. (8 hrs.)

UNIT 5 : STABILITY OF SLOPES:

Introduction, Types of Slope Failures, stability analysis of finite & infinite slopes, wedge failure, culman's method, Swedish circle method, Friction circle method, Taylor's stability number, stability problem in earth fill dam, improving stability of slopes. (7 hrs.)

UNIT 6: REINFORCEMENT OF SOIL:

Reinforcement, open excavating using soil nails, reinforcement of soil beneath foundation, introduction of Geosynthetics, Types of Geosynthetics, functions of geosynthetics, properties of geosynthetics, land slide protection in earth dam & tunneling with geosynthetics. (5 hrs.)

COURSE OUTCOME: Student will solve actual problems of stability with various material, they will apply various theories and predict the risk factor.

REFERENCE BOOKS:

1. Soil Engineering in theory and Practice – Alam Singh and Chowdhary G.R.
2. Soil Mechanics and Foundation Engineering- K.R.Arora.
3. Soil Mechanics and Foundation Engineering – Punmia B.C.
4. Soil Mechanics and Foundation Engineering – V.N.S Murthy.
5. Geotechnical Engineering – C. Venkatramaiah.
6. Geotechnical Engineering- S.K.Gulati & Manoj Datta.
7. Geotechnical Engineering – Purushothama Raj.
8. Basic and Applied Soil Mechanics – Gopal Rajan & ASR Rao.
9. Engineering Principles of ground modification- M.P. Housman
10. Engineering with Geosynthetics- Prof. G.V. Rao & V.S. Raju.

CE 307 ENVIRONMENTAL ENGINEERING –I

Teaching Scheme:	Examination Scheme:	Credit structure:
Lectures: 4 hours per week	Theory Paper: 80 marks	Theory: 03
	MSE: 20 marks	Practical: 01

Course Objectives

1. To acquaint the students with drinking water quality standards and forecast water demands.
2. Study of various units of water treatment plant, treatment procedures
3. To prepare the students to carry out design of water treatment plant
4. To acquaint the students with distribution system using appropriate methods.

SECTION -A

Unit 1: (6 hrs)

Introduction to water supply scheme, Sources of water, comparison of various sources, selection of source, raw water conveyance, types of Intake structures, selection of site for intake structure, pressure pipes, choice of pipe materials, forces acting on pressure pipes, gravity conduits.

Unit 2: (7 hrs)

Demand of water- types, Factors affecting demand, Variation in water demand and its effect, Factors affecting loss of water, Methods of Population forecasting, Numericals. Design period , factors affecting design period.

Unit 3: (7 hrs)

Water quality parameters, physical, chemical, and bacteriological characteristics, methods and significance, Drinking water quality standards.

Water borne diseases, precautionary measures, collection of sample for analysis.

SECTION -B

Unit 4: (8 hrs)

Water treatment- Theory of sedimentation, sedimentation tank- types, plain sedimentation, sedimentation aided with coagulation, components, types of coagulants, comparison of alum with iron compounds, design of clariflocculator, Theory of filtration, Slow sand, Rapid sand, pressure filters-Operation, design of RSF, Numericals on sedimentation aided with coagulation, rapid sand filter.

Unit 5: **(6 hrs)**

Disinfection techniques- Ozonation, ultra violate radiation, Types of chlorination, break point chlorination, residual Chlorine.

Water softening processes, chemical precipitation, ion exchange, reverse osmosis, electro dialysis, aeration- methods and necessity.

Unit 6: **(6 hrs)**

Water distribution systems, method of distributing water, types of valves, basic system requirements, hydraulic analysis head balance method, Distribution reservoir, service storage, Hardy cross method, Maintenance of water distribution system, numericals.

Course Outcomes

Upon successful completion of course the student will be able to:

1. Plan and design water supply systems for a rural/urban area

2. Use population forecasting methods.

3. Design various water treatment units and plan their operations on the basis of raw water quality and water demand.

4. Apply knowledge of advanced water treatment processes for individual water purification units.

TEXT BOOKS

1. Water Supply by Duggal K.N. and S.Chand and Company.

2. Water Supply by Garg S.K. Khanna Publishers.

3. Environmental Engineering by Peavey, H.S.Rowe D.R. and Tchobanoglous Mc Graw Hill Book Company.

2.Water Supply and Pollution Control by Viessman W.and Hammer M.J. Harper Collins

8. Water Supply Engineering by B.C.Punmia, Ashok Jain, Arun Jain, Laxmi Publications

CE 308 DESIGN OF STRUCTURES- II (RCC) LSM

Teaching Scheme:	**Examination Scheme:**	**Credit structure:**
Lectures: 4 hours per week	Theory Paper: 80 marks	Theory: 04
	MSE: 20 marks	Practical: 02

Course Objectives:-

1. Students will explore the stream "Limit State Method of Design for R.C. Structures". Students will be equipped with knowledge of different methods of design and its classifications.
2. Students will be introduced to Limit State Analysis as well which will open their wisdom for redistribution of moments in particular member.
3. Students will be competent to Design the structures for Limit Sate of Collapse for Flexure (Singly, Doubly, Fanged sections, Slabs, Staircase and Footing etc), Compression, Bending, Bond, Tosion and for Shear.
4. Students will be competent to Design the structures for Limit Sate of Serviceability for Deflection and Cracking.

UNIT- I :

1. Introduction to Limit State Design:

Design Philosophies, Types and classification of limit states, Characteristics strength and characteristic load, Load factor, Partial safety factors, Stress strain behavior of concrete and steel, Idealized stress strain curve. 4Hrs)

2. Limit analysis of R. C. structures:

Plastic hinge formation, Moment-rotation characteristics, Redistribution of moments, I. S. Code provisions for limit analysis and procedure of analysis. (4Hrs)

UNIT- II :

3. Limit State of Collapse (Flexure):

Singly and doubly reinforced sections, Properties of a section according to I. S. code, design parameters, maximum values, Analysis and design for flexure. (5 Hrs.)

4.Flanged Sections:

Analysis and design of singly reinforced T – beams and L- beams for flexure. (4Hrs)

UNIT- III :

5.Limit State of Collapse (Shear):

Shear failure, Factors affecting shear resistance of a R. C. member, Strength of R. C. beams in shear, Design of shear reinforcement. (3 Hrs.)

6.Limit State of Collapse (Bond and Torsion):

Types of bonds, Factors affecting bond resistance, Check for development length, Design for Torsion (2Hrs.)

UNIT-IV :

7. Limit State of Collapse (Flexure): Footing

Analysis and Design isolated footing (4Hrs)

8. Limit State of Collapse (Flexure): Slab

Design of one way and two way slab. Design of stairs (5Hrs)

UNIT- V :

9.Limit State of Serviceability (Deflection and cracking):

Significance of deflection, Types of deflection, Allowable deflection, Short-term and long-term deflection, L/D approach, deflection computations, Cracking-causes, mechanism and effects, Classification and types of cracks, serviceability requirements, Remedial measures.

(7 Hrs.)

UNIT- VI :

10.Limit State of Collapse (Compression and bending):

Analysis and design of axially loaded short columns, Analysis under uni-axial bending and axial compression, stress block parameters, Interaction (Pu-Mu) diagrams, Analysis and design of section, Bi-axial and axial compression, Slender columns design methods (Column design charts of SP-16 to be used). (8 Hrs.)

Course Outcomes: -

1 Students have explored the stream "Limit State Method of Design for R.C. Structures" and are equipped with knowledge of different methods of design and its classifications.
2 Students have been introduced to Limit State Analysis as well which has opened their wisdom for redistribution of moments.
3 Students are now competent to Design the structures for Limit Sate of Collapse for Flexure (i.e. Singly, Doubly, Fanged beam sections, Slabs, Staircase and Footing etc), Compression (i.e. Column), Bon, Torsion and for Shear.
4 Students are competent to Design the structures for Limit Sate of Serviceability for Deflection and Cracking.

Text Books:

1. Limit State Theory and Design: V.L. Shah and S.R. Karve

2. IS 456-2000

3. SP16

Reference Books:

1. Reinforced Concrete (Limit States): A.K.Jain

2. Limit State Design: Ramchandra

3. R.C.C Design: B.C. Punmia

4. Fundamental of Reinforced Concrete: Sinha and Roy.

5. Design of Concrete Structures: Bandopadhyay

CE 309 Transportation Engineering-II

(Airport Engineering, Railway Engineering and Tunnel Engineering)

Teaching Scheme:	**Examination Scheme:**	**Credit structure:**
Lectures: 4 hours per week	Theory Paper: 80 marks MSE: 20 marks	Theory: 03

Course objectives:

1. To study the basic elements of aircraft components and airport engineering .
2. To study about airport layout and geometric design of airport.
3. To learn about air traffic movements and control .
4. To study about airport capacity and drainage.
5. To study the basic elements of railway engineering & their component parts railways.
6. To study about geometric design of railway engineering
7. To learn about basic concepts of tunnel engineering and components parts and types.
8. To study about tunnel methods in soft rock and hard rock.
9. To study about drillings, explosives used in tunnels .

SECTION –A

Unit 1: Airport Engineering

1.1 Introduction : Aircraft component part and its function, Aircraft Characteristics and their influence on airport planning

1.2 airport planning – topographical and geographical features, air traffic characteristics, site selection, airport obstruction – zoning laws, classification of obstruction, imaginary surface, approach zones, turning zones. (04 hrs)

Unit 2 : Airport Design

2.1. Airport Layout:- Run way orientation, wind rose diagram, basic runway length, airport Classification,

2.2. Geometric design: airport capacity, run way configuration, taxi way design, geometric standards, exist taxi way, holding aprons, location of terminal building, aircraft hanger

2.3. Airport Marking and light marking: lightening of run way, taxiway and approach & other areas, airport layout , planning of terminal building apron, size of gate position, no. of gate position, aircraft parking system, 08 hrs

Unit 3 : Air traffic control

Air traffic control aids, en-route aids, landing aids. Airport drainage – requirement , design data, surface drainage design, airport airside capacity and delay, run way capacity and delay, practical hourly capacity, practical annual capacity, computation of run way system, run way gate capacity, taxiway capacity.

SECTION –B

Unit 4 : Railway Engineering

4.1 Introduction History of Indian Railways recent development in railways, Railway lines classification based on speeds such as A,B,C,D,E,Q,R and S routes. Merits of Rail transportation, Railway gauge & problems due to non uniformity of gauge,

4.2 Permanent way Component Parts :C/s of permanent way and track component , Sleepers – function and types , sleeper density, Ballast- function and different types of ballast materials , Rails – coning of wheels and tilting of rails, rail cross section, wear & creep of rails, rail fastening.

4.3 Geometric Design- Gradient, cant and cant deficiency. Speed on curves, (08hrs)

Unit 5 : Point & Crossing

Points, crossing and turnouts: Turnouts (Turnouts analysis and examples are not included in syllabus), descriptions of track junctions, different types of track junctions. Yards: details of different types of railway yards and functions.

Signalling & interlocking: - classification of signals, interlocking of signals and points, control of train movement, material requirement, maintenance of track , modernization of track and railway station for high speed trains, special measures for high speed track. (08 hrs)

Unit 6 : Tunneling

Detail Classification , Open cut Vs. Tunnels, method of transfer of alignment, problems in tunneling, tunneling methods (Shield, cut and cover, compressed air, drill and blast methods), linings – necessity and types, drilling –types, explosives- types TBM, mucking.

Course Outcome:-

1. In Airport Engineering students will get knowledge of Airport planning, layout and runway and taxiway components.
2. Students will get the feel of fundamentals of railway engineering from the syllabus. under railway Engineering students get knowledge of railway geometrics, Signalling & interlocking Points, crossing and turnouts etc.
3. Similarly students get knowledge regarding fundamentals of tunnel its excavation methods, support systems, and executional aspects of tunnel.

Text Books :

1. Airport planning and design By Khanna and Arora
2. Airport Engineering Rao G.V. , TMH
3. A Course of Railway Engineering By Saxena S.C., S.P. Dhanpat Rai and Sons.
4. Principal of Railway Engineering by S.C. Rangwala.
5. Indian Railway Track by Agrawal M.M. Sachdeva press New Delhi.
6. Tunnel Engineering By S.C. Saxena
7. Tunnel Engineering By R. Shrinivasan

Reference Books

1. Planning and Design of Airports: 4th Edition, by Robert Horonjeff and Francis McKelvey, McGraw-Hill, 1994.

2. Airport Systems: Planning Design and Management, by Richard DeNeufville and Amedeo Odoni, McGraw-Hill, 2003.

3.J.S. Mundrey ,"Railways Track Engineering",Tata Mcgraw Hill, New Delhi.

4. S.C. Rangawala,"Principals of Railway Engineering", Charotkar Publishing(Volume 3

5. V.N. Vazirani and S.P. Chandola,"Transportation Engineering",Dhanpat Rai Publications

6. G. V. Murthy, "Tunnels and Elements of Docks and Harbours"

7. Vicksburg, "Coastal Engineering Manuals Volume I and II", US Army Corps of Engineers.

8. S. C. Saxena, "Tunnel Engineering", McMillan Publications

CE 310 Water Resources Engineering –I

Teaching Scheme:	**Examination Scheme:**	**Credit structure:**
Lectures: 4 hours per week	Theory Paper: 80 marks MSE: 20 marks	Theory: 03

COURSE OBJECTIVES :

1. To know the different terminologies related with hydrology .
2. Analyze hydrological parameters required for water resource management .
3. Assess ground water potential .
4. To create awareness about floods , their estimation using various methods .
5. To understand the importance of irrigation in Indian agricultural industry considering cropping patterns.
6. To understand the principles of watershed management .

SECTION – A

UNIT- I **(8 hours)**

a) **Introduction To Engineering Hydrology** :

Definition , scope and its application , Hydrological cycle and Hydrological equation .

b) **Precipitation** : Mechanism , forms and types of precipitation , artificial rain . Measurement of Precipitation ,Rain gauge network , Estimation of optimum number of rain gauges , missing rainfall data , mean precipitation over a catchment , Graphical representation of rainfall – mass rainfall curve , hyetograph , DAD curves , intensity duration curve , intensity duration frequency curve ,PMP and its estimation.

UNIT-II **(7 hours)**

a) **Evaporation** : Evaporation process , factors affecting , measurement and estimation , methods to reduce evaporation .
b) **Evapo- transpiration**(ET) : Evapo transpiration process , factors affecting ,measurement and estimation . PET & AET , consumptive & non-consumptive uses .
c) **Infiltration** : Infiltration Process , factors affecting and measurement . Infiltration equations and indices .

UNIT-III **(8 hours)**

a) **Watershed Management** :- Watershed (catchments)– Definition , types and characteristics , Need and importance of water shed management .

b) **Run-off** : Run-off process , types , factors affecting , measurement and estimation .

c) **Hydrographs** :Flood hydrographs , components of hydrographs ,base flow separation ,effective rainfall , direct runoff hydrographs , Unit hydrograph theory , assumptions , uses and limitations of UHG., Construction of unit hydrograph , S-curve hydrograph ,Conversion of UHG by S-curve technique .

SECTION –B

UNIT-IV **(7 hours)**

a) **Floods** :Design flood , methods of estimation –(Empirical formulae , UHG method , Frequency analysis , Gumballs , Log Pearson Type –III distribution methods) Benefits of flood estimation , flood control techniques , flood routing .

b) **Stream Gauging** :Objects , selection of site , discharge measurement by Area – velocity method, slope area method , salt –tracer method (Chemical method) , stage , stage measurement , stage –discharge relationship , flow mass curve and flow duration curve .

UNIT-V **(8 hours)**

a) **Ground Water Hydrology** : Definition, occurrence and distribution of ground water , Aquifer and their types ,aquifer parameters , hydraulics of well under steady flow conditions in un-confined and confined aquifers , ground water recharge and discharges , ground water exploration
open well –safe yield , pump tests , comparison of open well and tube well , various types of pumps used and its selection .

b) **Water logging** : Definition ,causes , effects and remedial measures , drainage of irrigated lands.

c) **Minor irrigation work** : General layout , main components and functioning of –
1. Percolation tanks . 2. K.T.weir 3. Bundara irrigation 4.Lift irrigation .

UNIT –VI **(8 hours)**

a) **Introduction to Irrigation Engineering** :Definition, necessity, advantages of irrigation , types of irrigation system , scope of irrigation engineering .

b) **Crop Water Requirement** :Factors affecting crop water requirement , principle crops and crop seasons in India and Maharashtra , duty , delta , base period and its relationship. Factors affecting duty and methods to improve it . Crop rotation and its significance, Various methods of applying the water and their comparison.

c) **Soil -Water - Crop relationship** : Types of soil and its suitability for different crop , soil water and its types , wilting point ,field capacity , optimum moisture content , depth and frequency of irrigation.

OUTCOMES :

1. Student will know the different terminologies related with hydrology .
2. Students will analyze hydrological parameters required for water resource management.
3. Student will assess ground water potential .
4. Students will identify suitable method of irrigation and drainage of waterlogged area .

TEXT BOOKS :

1. Engineering Hydrology - Subramanya S : , Laxmi Publication , Delhi
2. Engineering Hydrology - Dr.Reddy Jayarami P:,Laxmi Publication ,Delhi
3. Irrigation Water resources & Water Power Engg.-Dr.P.N.Modi , standard Book house .

REFERANCE BOOKS :

1. Engineering Hydrology – Raghunath H.M. , Wiley Eastern Ltd.,New Delhi
2. Engineering Hydrology and water resources Engg.-Sharma R.K., Dhanpatrai & sons .
3. Engineering Hydrology & water resources Engg.-S.K.Garg ,
4. Applied Hydrology – Linsley R.S.
5. Irrigation Theory & Practice – A.M.Michael
6. Irrigation & Water Power Engg.- Dr.B.C.Punmia , Standard Publication
7. Watershed management in India – J.V.S.Murthy –Wiley eastern Publication ,Delhi .

CE 311 a) Infrastructure Engineering (Elective –I)

Teaching Scheme:	**Examination Scheme:**	**Credit structure:**
Lectures: 4 hours per week	Theory Paper: 80 marks	Theory: 03
	MSE: 20 marks	Practical: 01

Course Objectives:

1. To know the importance of Infrastructure projects for national development
2. To understand different concepts & importance of Infrastructure planning & Management
3. To understand different concepts of Public Private Partnership in Infrastructure project
4. To understand various Challenges which affect the Successful completion of Infrastructure Project.
5. To understand different concepts & importance Risk management for Infrastructure Project
6. To understand different Strategies for Successful Infrastructure Project Implementation

SECTION-A

Unit- 1. Infrastructure Introduction

Definition of Infrastructure, Necessity of Infrastructure development, Characteristics of infrastructure projects, Scope of Infrastructure Engineering in National and Global development, Types of infrastructure, Growth of Infrastructure projects in India: An Overview of the Power Sector in India. An overview of the Road, Rail, Air and Port Transportation Sectors in India. An overview of the Telecommunications sector in India, An overview of the Urban Infrastructure in India. **(6Hrs.)**

Unit -2 Infrastructure Planning

What is planning, Importance of Infrastructure planning, Sources of Infrastructure Finance. Time value of money, An Introduction to Special Economic Zones. Organizations & Players in the field of Infrastructure. The Project Life Cycle (Phases) **(6Hrs.)**

Unit- 3. Public Private Partnership in Infrastructure

What is Public Private Partnership? The benefits of Infrastructure privatization (PPP), Working Process for Public Private Partnership, Advantages & Disadvantages of Public

Private Partnership, Phases of a Public Private Partnership Project, Problems with Infrastructure Privatization, Government's role in successful PPP projects. **(8 Hrs.)**

SECTION-B

Unit- 4. Challenges to Successful Infrastructure Planning and Implementation

Challenges faced by construction industry, Economic and Demand Risks, Political Risks, Socio-Environmental Risks, Cultural Risks in International infrastructure projects, Infrastructure Challenges in Construction and Maintenance of Infrastructure projects. **(6Hrs.)**

Unit- 5. Risk Management for infrastructure projects

Definition of risk, objective of Risk management, need of Risk management, Risk in construction projects, Role of risk manager, Risk management, Risk identification, Risk Analysis, Risk response, Risk monitoring and control, Risk associated with various infrastructure projects. **(8Hrs.)**

Unit -6 Strategies for Successful Infrastructure Project Implementation

Introduction to Strategic Management Concepts, Introduction to Fair Process and Negotiation. Negotiating with multiple Stakeholders on Infrastructure Projects. Information Technology and Systems for Successful Infrastructure Management. An Integrated Framework for Successful Infrastructure Planning and Management **(6Hrs.)**

Course Outcomes

After the completion of this course the students would be able to:

1. Understand the role of Private sector in infrastructure growth.
2. Know stages of an Infrastructure Project Lifecycle.
3. Consider challenges to Successful Infrastructure Planning and Implementation.
4. Understand the strategies for Successful Infrastructure Project Implementation.
5. Prepare Strategies for Successful Infrastructure Project Implementation.
6. Understand the need to plan, develop and maintain infrastructure at a high level.
7. Understand the importance of Risk Management for the successful completion Infrastructure Projects

Reference Books

1. Alvin Goodman, Makarand Hastak, Infrastructure Planning Handbook: Planning, Engineering, and Economics 1st Edition, MH/ASCE press.
2. Akintoye, A., Beck, M., & Hardcastle, C. (Eds.). (2003). Public-Private Partnerships - Managing risks and opportunities. Oxford: Blackwell Science Limited.
3. Grigg, Neil, Infrastructure Engineering and management, Wiley, (1988).
4. Hudson, Haas, and Uddin, Infrastructure management: integrating design, construction, maintenance, rehabilitation, and renovation, McGraw Hill, (1997).
5. World Development Report 1994: Infrastructure for Development (1994).
6. Hudson W. and Ralph H. Infrastructure Management: Integrating Design, Construction, Maintenance, Rehabilitation and Renovation, Tata Mc Graw Hills.
7. Weber, B., & Alfen, H. W. (2010). Infrastructure as an asset class - Investment strategies, project finance and PPP. West Sussex: John Wiley & Sons
8. Risk Management and Construction ,Roger Flanagan, George Norman
9. Particle Risk Management in Construction Industry, Leslie Edwards
10. A. S. Goodman and M. Hastak, Infrastructure planning handbook: Planning, engineering, and economics, McGraw-Hill, New York, 2006.
11. J. Parkin and D. Sharma, Infrastructure planning, Thomas Telford, London, 1999.

CE 311 b) SOLID WASTE MANAGEMENT (Elective-I)

Teaching Scheme:	**Examination Scheme:**	**Credit structure:**
Lectures: 4 hours per week	Theory Paper: 80 marks	Theory: 03
	MSE: 20 marks	Practical: 01

General objective:-

Students will able to

1. Understand various types of solid waste produced with their characteristics
2. Understand different methods of collection, transportation and disposal of solid waste.
3. Apply different method of disposal of solid waste for safe disposal.
4. Understand concept of Bio medical waste, E-waste and Industrial waste.
5. Understand recycling and reuse of solid waste.
6. Understand different transportation equipments with their limitations

SECTION-A

Unit-I

Definition of solid waste, meaning of different solid waste, sources of solid waste, Classification of solid waste - hazardous and non-hazardous waste, composition and quantity of refuse, Physical and Chemical characteristics, Impact of solid waste on environment, Solid waste management techniques - solid waste management Hierarchy, waste prevention and waste reduction. (6Hr.)

Unit-II

Generation rate, Factors affecting on solid waste generation, Storage of municipal waste, Different methods of collection system, transfer and transportation of refuse, Transfer station-meaning, necessity, location, Organization pattern of solid waste management. (6Hr.)

Unit-III

Definition of Biomedical Waste, Sources and generation of Biomedical Waste, Classification of Biomedical Waste Management technologies, Biomedical waste management & handling as per rule 1998, Definition of E- waste, Varieties of E- waste, Dangers of E- waste, Disposal of E- waste, Recycling of E- waste. (7Hr.)

SECTION-B

Unit-IV

Theory of Composting, Principles of composting process, Factors affecting on composting process, Methods of composting - Manual Composting - Bangalore method, Indore Method, Mechanical Composting - Dano Process, Vermicomposting- Concept, Land filling technique,

Factors for site Selection, Land filling methods, Leachate and its control, Biogas from landfill. (7Hr.)

Unit-V

Incineration of waste, Types of incinerators-Multiple chamber incinerators and Municipal Incinerators, Products of incineration process with their use, Pyrolysis of waste –Definition, methods, by products. . (7Hr.)

Unit-VI

Health aspect during handling and processing, Health problem during time of segregation, reuse, recovery, recycling of solid waste, Public Involvement and participation in Solid waste management, purpose of recycling, Benefits of recycling. Solid waste recycling in India, concept of green building. (7Hr.)

COURSE OUTCOMES:

The theory should be carried out in such a manner that students are able to acquire different learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

I. Explain municipal solid waste management systems with respect to its physical properties, and associated critical considerations in view of emerging technologies

II. Outline sources, types and composition of solid waste with methods of handling, sampling and storage of solid waste.

III. Select the appropriate method for solid waste collection, transportation, redistribution and disposal.

IV. Describe methods of disposal of solid waste.

Reference books:

1 Solid Waste Management – Dr. A. D. Bhide

2 Solid Waste Management –Gorge Tchobanoglous

3 Solid Waste Management Hand Book – Pavoni

4 Composting – Gottas

5 Handbooks and Solid Waste Disposal – Techabonglaus

6 Manual on Municipal Solid Waste Management by Ministry of Urban Development of Govt. of India.

CE 311 c) ADVANCE STRUCTURAL ANALYSIS. (Elective-I)

Teaching Scheme:	**Examination Scheme:**	**Credit structure:**
Lectures: 4 hours per week	Theory Paper: 80 marks	Theory: 03
	MSE: 20 marks	Practical: 01

Course Objectives:

1. To introduce the students to basic concepts of structural analysis and the mathematical/computational methods for the analysis of basic structural elements to make them able to withstand the challenges in present world.

2. After learning, students can make suitable approximations so that an indeterminate structure is reduced to a determinate structure

Unit I: Basic Pre-requisite for engineers (04 hours)

Computer algorithm and flowcharts of: - matrix algebra, computer oriented numerical methods-Gauss elimination, Gauss Jordon and Gauss Seidel

(Practice of above methods with any suitable computer programming language)

Unit II: Flexibility matrix method for trusses and frames (06 hours)

Flexibility matrix, Analysis of pin jointed indeterminate trusses and simple portal frames with sway and non-sway, differential level of supports type

(Involving not more than three unknowns)

Unit III: Stiffness matrix method for bar, trusses and frames (08 hours)

a) Degree of kinematic indeterminacy (degrees of freedom), local and global coordinate systems, stiffness matrices of a axially loaded bar members, analysis of determinate and indeterminate bars **(Involving not more than three unknowns)**

b) Stiffness matrices of a truss member, analysis of determinate and indeterminate trusses **(Involving not more than three unknowns)**

c) Stiffness matrices of a portal frames with sway and non-sway, differential level of supports type **(Involving not more than three unknowns)**

Unit IV: Approximate methods for analysis of building frame (08 Hours)

Approximate methods for vertical loads on multistoried building frame.

Unit V: Approximate methods for analysis of Indeterminate Structures (08 hours)

Analysis of internally indeterminate truss, Analysis of Lateral Loads on Building Frames: Portal Method, Cantilever Method

Unit VI: Finite Difference Method (FDM) (06 Hours)

Basics of FDM, Finite difference formulation for a one-dimensional problem, Finite difference formulation for time dependent problem, numerical based on above two.

Reference Books :

[1] Matrix Methods of Structural Analysis- Wang, C. K., International Textbook Co., 1970.

[2] Matrix Analysis of Framed Structures – Gere & Weaver- CBS Publications, Delhi

[3] Matrix & Finite Element analysis of structures – A.H. Shaikh and Madhujit Mukhopadhyay

[4] Numerical Methods for Engineering – S.C. Chapra& R.P. Canale Tata McGraw Hill Publication

[5] Structural Analysis – A Matrix Approach - Pandit& Gupta - Tata McGraw Hill Publication

[6] Matrix Methods of Structural Analysis – Meghare&Deshmukh- Charotar Publishing House, Anand.

[7] Structural Analysis- R. C. Hibbeler, Pearsons Pentice hall

CE 311 d) Advanced Concrete Technology (Elective-I)

Teaching Scheme:	**Examination Scheme:**	**Credit structure:**
Lectures: 4 hours per week	Theory Paper: 80 marks	Theory: 03
	MSE: 20 marks	Practical: 01

Course Objectives:

1. To study and focuses more on detailed understanding of concrete making materials including supplementary cementetious materials.
2. To study recent developments in concrete materials.
3. To study and develop adequate understanding on concrete production process, properties and uses of concrete as a modern material of construction.
4. The courses will enable one to make appropriate decision regarding ingredient and admixture selection for concrete
5. The course gives information of concrete mix design , its durability and Inspection technique of hardened concrete

Unit -1 8 Hours

Supplementary cementing materials and pozzolans.

Fly ash, blast furnace slag, silica fume, and met kaolin - their production, chemical composition; physical characteristics; chemical and physical processes of hydration ,effects on properties of concretes

Unit -2 8 Hours

Special concretes:

Properties and applications of: High strength - high performance concrete, reactive powder concrete, Lightweight, heavyweight, and mass concrete; fibre reinforced concrete; self-compacting concrete, shotcrete, roller compacted concrete, jet cement concrete ferrocement.

Unit – 3 6 Hours

Admixtures – Property and application

Special admixtures- Accelerator, retarder, grouting admixtures, air entraining admixtures, Gas forming admixtures, corrosion inhibiting admixtures, shrinkage reducing admixtures, Bonding admixtures

Unit-4 6 Hours

Concrete mix design:

Basic principles; IS method; ACI method; new approaches based on rheology and practical approach.

Unit – 5 6 Hours

Ready-mixed concrete.

Types of plant; truck-mixer efficiency; effects of prolonged agitation; quality control: acceptance and compliance. Batching plant and ancillary equipment for improving accuracy; mixers; distributing plant.

Unit- 6 6 Hours

Durability of concrete

Introduction to durability, relation between durability and permeability. Chemical attack of concrete, corrosion of steel rebar, Other durability issues. Assessment of concrete construction.

Inspection of concrete and investigation of failures; assessment of concrete strength in structures; surface blemishes - causes and remedies. Destructive and non destructive test

Course outcome

1. Students are able to decide the use of supplement cementatious in concrete, use of different admixture and its application as per requirement.
2. Students are capable to understand the special concrete, its properties and application as per requirement.
3. Students are able to do concrete mix design for required strength of concrete with different approach.
4. Students are able to know details of ready mix concrete plant.
5. Students are able to understand the durability of concrete, assessment and inspection of hardened concrete.

Reference Book

1. Concrete technology by M.S.Shetty
2. Newman John & Ban Sang Choo. "ADVANCED CONCRETE TECHNOLOGY " Elsevier 2003.
3. Handbook on Advance concrete technology by N.V. Nayak & A.K. Jain
4. Concrete technology by M.L. Gambhir

CE 307 ENVIRONMENTAL ENGINEERING –I

(Laboratory)

Teaching Scheme	**Examination Scheme**
Practical: 2 hrs/week	Practical Examination: 70 marks
	Term Work: 30 marks

TERM WORK

The term work includes practical work to find the characteristics of water

(A) Experiments for the determination of the following (Min.08)

1 PH value

2 Alkalinity

3 Acidity

4 Chloride content

5 Hardness

6 Turbidity

7 Determination of metallic ions by using flame photometer.

8 Solids – Total, Suspended, dissolved, volatile and fixed

9 Dissolved Oxygen

10 Optimum dose of alum by jar test

11 Irons and Manganese

(B) Design /Analysis Problems on each water treatment unit and distribution system.

(C) Visit to water treatment plant

Term work submission shall consist of journals containing

1. Above mentioned Experiments

2. Visit report describing the water treatment units of the plants visited.

3. Design problems mentioned in (B)

CE 308 DESIGN OF STRUCTURES- II (RCC) LSM

(Laboratory)

Teaching Scheme
Practical: 2 hrs/week

Examination Scheme
Practical Examination: 70 marks
Term Work: 30 marks

Term work:

Term work shall consist of 10 assignments based on above syllabus.

Practical examination:

It consists of oral examination based on the above term-work.

CE 311 a) Infrastructure Engineering (Elective –I)

(Laboratory)

Teaching Scheme
Practical: 2 hrs/week

Examination Scheme
Practical Examination: 70 marks
Term Work: 30 marks

Term work:
Term work will consist of

A) Site Visit & Case study

- Two site visit to any Infrastructure project (Bridges, Highways & Express way, Tunnels, Railways- Metro rail, Mono Rail, Airports, Seaports, Power plants, Dams& Water storage structures, Electricity generation projects, Water supply treatment, & wastewater Treatment projects, Under water construction projects, chimney structure &construction etc.) and submission of Detailed reports
- Two case study for infrastructure project

B) Assignments

Term work shall consists of assignments based on above syllabus

Practical examination:

It consists of oral examination based on the above term-work.

CE 311 b) SOLID WASTE MANAGEMENT (Elective-I)

(Laboratory)

Teaching Scheme
Practical: 2 hrs/week

Examination Scheme
Practical Examination: 70 marks
Term Work: 30 marks

TERM WORK:

1) At least six Assignment based on six unit

2) Visit nearer Bio-medical waste disposal site and preparation of report on visited site.

3) Preparation of a report on municipal solid waste collection system of nearer area.

Practical examination:

It consists of oral examination based on the above term-work.

CE 311 c) ADVANCE STRUCTURAL ANALYSIS. (Elective-I)

(Laboratory)

Teaching Scheme	**Examination Scheme**
Practical: 2 hrs/week	Practical Examination: 70 marks
	Term Work: 30 marks

Practice of following should be made by students using any computational tool such as **SciLab**

SciLab is preferred for all the following programs as it is open source and adopted by many leading educational institutes in the world.

Group [A] Basic skills

1. Addition, subtraction, multiplication of square matrices.

2. Program for Gauss elimination, Gauss Jordon and Gauss Seidel method for min 3 and maximum 5 unknowns.

Group [B] Implementation with a computer program on SciLab and software package like STAAD, STRUD, ETAB, SAP, etc

1. Computer program to find degrees of freedom (DOF) of structure.

2. Practice of stiffness matrix method for the analysis of determinate and indeterminate bar using software package and computer program.

3. Practice of stiffness matrix method for analysis of determinate and indeterminate trusses using software package and computer program.

4. Practice of stiffness matrix method for analysis of a portal frames with sway and non-sway type using software package and computer program.

5. Analysis of internally indeterminate truss using software package.

Group [C] Manual Implementation

1. Analysis of Lateral Loads on Building Frames using Portal Method, Cantilever Method.

Term work shall be based on all the above content.

Computer programs should content input, program and output prints with flowchart of method implemented in programming.

CE 311 d) Advanced Concrete Technology (Elective-I)

(Laboratory)

Teaching Scheme	**Examination Scheme**
Practical: 2 hrs/week	Practical Examination: 70 marks
	Term Work: 30 marks

The term work consist of laboratory experiments performed during the semester. The list of the experiments is mentioned below (perform any Six)

01. Determination of flexural strength of concrete
02. Mix Design by I.S. Code method (with OPC Cement)
03. Mix Design by I.S. Code method (with Slag Cement)
04. Mix Design by I.S. Code method (with Admixtures Cement)
05. Determination of Modulus of elasticity of concrete
06. Demonstration of Determination of Compressive strength of concrete by non destructive test – Rebound Hammer.
07. Determination of compressive strength of concrete by adding fly ash, silica fume and blast furnace slag.
08. Study of the effect of w/c ratio on workability and strength of concrete