Appendix-A

Four Year Degree Course in Engineering & Technology
Course and Examination Scheme with CBCS System
VII Semester B.E. (Civil Engineering)

Subject Code	Subject	Teaching Scheme				Examination Scheme								
		Hours per week				Theory					Practical			
		L	T	P	No. of Credits	Duration of Paper (Hrs.)	Max. Marks Theory Paper	Max. Marks College Assessment	Total	Min. Passing Marks	Max. Marks External	Max. Marks Internal	Total	Min. Passing Marks
CE-701	Irrigation Engineering	3	1	0	3	3 Hrs.	80	20	100	40	-	-	-	-
CE-702	Structural Analysis-III	4	1	0	3	4 Hrs.	80	20	100	40	-	-	-	-
CE-703	Design of RCC Structure-II	3	1	0	3	4 Hrs.	80	20	100	40	-	-	-	-
CE-704	Ground Improvement Techniques	3	0	0	3	3 Hrs.	80	20	100	40	-	-	-	-
CE-705 CE-709	Programme Elective - III	3	1	0	3	3 Hrs.	80	20	100	40	-	-	-	-
	Practicals													
CE-710	Irrigation Engineering	0	0	3	2	-	-	-	-	-	25	25	50	25
CE-711	Design of RCC Structure-II	0	0	3	2	-	-	-	-	-	25	25	50	25
CE-712 CE-716	Programme Elective - III	0	0	3	2	-	-	-	-	-	25	25	50	25
Ce-717	Industrial Case Study	0	0	3	2	-	-	-	-	-	25	25	50	25
CE-718	Project Phase - I	0	0	3	2	-	-	-	-	-	50	50	100	50
	Total	16	4	15	25	-	-	-	-	-	-	-	300	
	Semester Total	35			25	800								

Code **Programme Elective - III**
CE-705 Advanced RCC Design
CE-706 Remote Sensing & GIS
CE-707 Advanced Soil Mechanics
CE-708 Design of Hydraulic Structure
CE-709 Advanced Prestress Concrete

Appendix-A

Four Year Degree Course in Engineering & Technology
Course and Examination Scheme with CBCS System
VIII Semester B.E. (Civil Engineering)

Subject Code	Subject	Teaching Scheme				Examination Scheme								
		Hours per week				Theory					Practical			
		L	T	P	No. of Credits	Duration of Paper (Hrs.)	Max. Marks Theory Paper	Max. Marks College Assessment	Total	Min. Passing Marks	Max. Marks External	Max. Marks Internal	Total	Min. Passing Marks
CE-801	Quantity Surveying & Estimation	3	1	0	4	4 Hrs.	80	20	100	40	-	-	-	-
CE-802	Transportation Engg.-II	3	1	0	3	3 Hrs.	80	20	100	40	-	-	-	-
CE-803	Pavement Design	3	1	0	3	3 Hrs.	80	20	100	40	-	-	-	-
CE-804 CE-808	Programme Elective - IV	3	1	0	4	3 Hrs.	80	20	100	40	-	-	-	-
	Practicals													
CE-809	Quantity Surveying & Estimation	0	0	3	2	-	-	-	-	-	25	25	50	25
CE-810 CE-814	Programme Elective - IV	0	0	3	2	-	-	-	-	-	25	25	50	25
CE-815	Project Phase - II	0	0	6	6	-	-	-	-	-	100	100	200	100
	Total	12	4	12	24	-	-	-	-	-	-	-	300	-
	Semester Total	28			24	700								

Code **Programme Elective - IV**
CE-804 Experimental Stress Analysis
CE-805 Advanced Design of Steel Structure
CE-806 Water Transmission & Distribution System
CE-807 Design of Water & Waste Water Treatment System
CE-808 Applications of System Engineering

B.E. Civil Engineering, VII Sem

COURSE CODE: CE -701 **COURSE: IRRIGATION ENGINEERING**

Course scheme					Evaluation scheme (Theory)				
lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper hour	MSE	IE	ESE	Total
3	1	-	4	3	3 Hr	10	10	80	100

Unit	CONTENTS	Hours
I	GENERAL: Necessity and importance of Irrigation Engineering, Benefits & effects of Irrigation, Classification of Irrigation, General principles of flow, lift, perennial, inundation Irrigation systems, Comparative study of sprinkler and drip Irrigation systems. WATER REQUIREMENT OF CROPS: Suitability of soils for Irrigation, Standards of irrigation water, PET-R method of crop water requirements, Depth and frequency of Irrigation, definitions of field capacity wilting point, available moisture, duty, delta, GCA, CCA, or depth, base period outlet factor capacity factor, time factor, root zone depth: Relation between duty and delta; Factors affecting duty, Principal crops in India, Crop rotation; Methods of assessment of Irrigation water..	**9**
II	RESERVOIR PLANNING : Selection of site for Reservoirs; Engineering surveys, Geological and Hydrological Investigations; Fixing of LWL, FTL, TBL, HFL; Diriment storage zones in reservoir, Determination of storage capacity by mass curve method; Reservoir sedimentation; Life estimation of reservoir by Burn's method; Organization & Administration of Irrigation Projects WATER LOGGING AND LAND DRAINAGE : Causes, effects, preventive measures of water logging, types of drains, layout of tile drains systems, flow of ground water to drains. RIVER TRAINING WORKS : Definition, classification, theoretical aspects of river training works like as Guide banks, Groynes and Spurs, Bank protection.	**9**
III	DAMS Classification of dams as per use, Hydraulic design and materials; Factors governing selection of type of dams. GRAVITY DAM: Definition; forces acting on gravity dam; stability	**9**

	requirements; Theoretical & practical profile of gravity dam; low & High dam; Galleries. EARTHEN DAMS: Types of earthen dam; Description of component part of earthen dams foundation, cut off trench, rock toe, hearting, central impervious core, pitching and chipping, turfing; seepage through body of earthen dam and drainage arrangements; Failure of earthen dams; Plotting of phreatic line for homogeneous earthen dams with horizontal filters; Stability of foundation against shear. SPILLWAYS : Types of spillway with their working operations; General principle of design of ogee spillway; Spillway gates-vertical lift radial, rolling and drum; Energy dissipation methods d/s of spillways.	
IV	CANALS: GENERAL: Types of canal; Alignments of canal; Cross section of Irrigation canals; Blanching depth; Schedule of area statistics; Losses in canals. CANALS IN ALLUVIAL SOILS: Kennedy‘s silt theory – Design procedure _ silt supporting capacity, drawbacks; Lacey‘s silt theory – Definition of initial final and permanent regime channels, Lacey‘s Regime equation, channel design procedure, drawbacks; Garret‘s diagram for channel design. LINED CANALS: Design procedure; Types of lining; relative merits and demerits of canal lining; Economics of canalling	**9**
V	CANAL STRUCTURES CANAL REGULATION WORKS: Only theoretical aspects of location, objects, classification, component and schematic section of head regulator, cross regulators, canal escapes, canal falls and canal outlets. CROSS DRAINAGE WORKS Only theoretical aspects of location, object, classification, components and schematic section of aqueduct, siphon, super passage, canal siphon, inlets, outlets and level crossings. DIVERSION HEAD WORKS:Component parts of diversion headwork‘s – Fish ladder guide wall‘ divide all silt excluder and silt ejector; Causes of failure of weirs on permeable foundation; Blight‘s creep theory; dr. Khosla‘s theory for design of weirs on permeable foundation. .	**9**

Recommended Books:-

1. Irrigation Engineering and Hydraulic Structures- Santosh Kumar Garg- khanna publication

2. Irrigation Engineering and Hydraulic Structures- S. R. Sahastrabudhe- katson publication

3. Irrigation Engineering and Water Power Engineering – B. C. Punmia-laxmi publication

4. Irrigation Engineering and Hydraulic Structures- K. R. Arora- jain year of publication

5. Irrigation Engineering- N. N. Basak- jain year of publication

6. Irrigation Engineering and Hydraulic Structures- R. K. Sharma- S. Chand publication

7. Water Resources and Irrigation Engineering – P. N. Modi

Course Code: CE -710 **Course: IRRIGATION ENGINEERING PRACTICAL**

Course scheme					Evaluation scheme (Practical)		
lecture	Tutorial	Practical	Periods/week	Credits	TW	POE	Total
-	-	3	3	2	25	25	50

A. Detailed Design and Drawing on full sheet (A1)should be included (Minimum Five) as term work.

1. Reservoir Planning – Capacity of reservoir.
2. Life of Reservoir
3. Gravity Dam – Checking of various modes.
4. Earthen Dam – Phreatic Line, Checking of foundation against shear
5. Design of canals (Lined and Unlined)
6. Design of Lift Irrigation Scheme.
7. Drawing of various canal structures.

B. Detailed report of one Site visit to irrigation project in spiral binding form must be submitted with above five practical.

B.E. Civil Engineering, VII Sem

COURSE CODE: CE -702 COURSE: STRUCTURAL ANALYSIS -III

Course scheme					Evaluation scheme (Theory)				
lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper hour	MSE	IE	ESE	Total
4	1	0	5	3	4	10	10	80	100

COURSE OUTCOMES:

The students shall be able to

1. Formulation of stiffness matrix, transformation matrix, load matrix for various structural components for analysis purposes and understanding of structural software.
2. Apply the different methods of analysis of frames in practical problems.
3. Understand the concepts related to structural dynamics.
4. Understand the basics of finite element method in the analysis of structural components.

Unit	Topics	Hours
I	Formulation of element/local stiffness matrix and global stiffness matrix for beam members (with and without axial deformation). Continuous beams with/without sinking of support, Assembly of global/ structural stiffness matrix, Member load matrix due to concentrated load, uniformly distributed Load varying load and moment. Assembly of global/ structure load matrix up to Three Elements. Solution to problems with maximum degree of freedom Three and formulation of stiffness matrix upto DOF 6.	**(10)**
II	Formulation of element/ local stiffness matrix and global stiffness matrix for Plane frame members (with and without axial deformation), Transformation matrix, Assembly of global/ structural stiffness matrix, Member load matrix due to concentrated loads, uniformly distributed Loads, varying load, Moments. Assembly of global/ structural load matrix. Plane frame problems with maximum degree of freedom six and Solution to problems with maximum degree of freedom Three. Inclined member problems, Analysis of plane frame upto 3 DOF with support displacement.	**(12)**

III	Basic concept, Degree of Freedom, Basic concept of Direct Stiffness Method. Formulation of elemental/local stiffness matrix and global stiffness matrix for plane truss. Transformation Matrix, Assembly of Global/ Structural stiffness matrix up to (8x8). Member load matrix including lack of fit, Support displacement and temperature. Assembly of Global/ Structure load matrix, Solution to problems with maximum degree of freedom four.	**(12)**
IV	Introduction to structural dynamics, D'Alembert principle, inertia force, equation of motion (free vibration), SDOF system, Damping, natural frequency. MDOF, vibrations of undamped systems up to 2 DOF.	**(8)**
V	Introduction to finite Element method, basic concepts, discretization of structures, Minimum potential energy theorem and Rayleigh Ritz method for bar elements (prismatic/Non-prismatic), Displacement based bar elements (Prismatic/Non-prismatic). Storage techniques, Half band storage, half band width, Sky line storage.	**(8)**

REFERENCE BOOKS:

1. Gere and Weaver, Matrix Method of Structural Analysis, Third Edition, Von Nostrand Reinhold; New York 1990.
2. Meghre A. S. and Deshmukh S. K., Matrix Method of Structural Analysis, First Edition, Charotar Publishing House, Anand 2003.
3. Chandrupatala T.R., Belegundu A. D., Introduction to Finite Element in Engineering, Prentice Hall India, 1991.
4. Chopra A. K., Dynamics of Structure, Theory and Application of Earthquake Engineering, Third Edition, Pearson.
5. Krishnamurthy C. S., Finite Element Method, TATA McGRAW HILL.

B.E. Civil Engineering, VII Sem

COURSE CODE: CE -703 **COURSE: Design of RCC structure II**

Course scheme					Evaluation scheme (Theory)				
lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper hour	MSE	IE	ESE	Total
3	1	0	4	3	4	10	10	80	100

UNIT	TOPICS	HOURS
I	Limit state of collapse in flexure : Analysis and design of doubly reinforced rectangular, Tee and L-sections. Limit state of collapse in torsion: Concept of interaction of torsion , shear and flexure . Analysis and design of rectangular section for torsion , shear and flexure. Limit state of serviceability: Deflection calculations for beams and one way slabs.	(9)
II	Analysis and design of columns subjected to biaxial moments . Design of long columns. Design of long columns. Design of isolated footing, for uniaxial and biaxial bending, for square , rectangular and circular.	(9)
III	Moment redistribution Analysis and Design of Fixed beam , propped Cantilever , two –span Symmetric continuous beam.	(9)
IV	(with LSM) Analysis and design of portal frames (single bay single storey) hinged or fixed at base. Design of hinge and design of foundation. Design of combined footing 1) rectangular footing 2) strap beam footing 3)Trapezoidal footing . 4) Raft footing.	(9)
V	(with LSM) Design of RCC Two way slab with various end conditions using with is code coefficient. Design of RCC Cantilever and Counter fort Retaining wall.	(9)

Recommended books:

1. Reinforced Concrete Structures, Volume 2 ,Dr. B. C. Punmia, Ashok Kr. Jain, Arun Kr. Jain, Dr. B.C. Punmia, Ashok Kr. Jain, Arun Kr. Jain-Firewall Media
2. Reinforced Concrete Design, (3rd edition) by Unni Krishna Pillai S. and Devdas Menon, Tata McGraw-Hill, 2012.
3. Reinforced Concrete (Limit State Method) Ashok Jain K., Nemchand & Bros., Roorkee, 2007.
4. Limit State theory and Design of reinforced concrete by Karve, S. R. and Dr. Shah V. L., Pune Vidyarthi Griha Prakasan, Pune, 2012.
5. Limit State Design of Foundations, (2nd edition) by Varghese P.C., PHI Learning Pvt. Ltd., New Delhi., 2008.

6. Advanced design of R.C. Structures, (2nd edition) by Bhavikatti S.S., 2009.
7. Design of concrete structures, (13th edition) by Arther Nilson H., Tata Mc Graw-Hill, 2010. Web Reference books: NPTEL
8. IS CODE: IS 456 – 2000 and 15875-1987 is permitted in the examination.

Question Paper Pattern – 1) One question of 13 Marks each from Unit I,II & III
2) One question of 20 Marks each from Unit V & VI

COURSE CODE: 711 COURSE: DESIGN OF RCC STRUCTURE II (PRACTICAL)

Course scheme				Evaluation scheme (LABORATORY)		
Lecture	Tutorial	Practical	Credits	TW	POE	Total
		3	2	25	25	50

LIST OF EXPERIMENTS

1. Minimum three designs on above syllabus and drawing on A 1 Size drawing sheet.

B.E. Civil Engineering, VII Sem

COURSE CODE: CE -704 COURSE: GROUND IMPROVEMENT TECHNIQUES

Course scheme					Evaluation scheme (Theory)				
lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper hour	MSE	IE	ESE	Total
3	0	-	3	3	3 Hr	10	10	80	100

Unit	CONTENTS	Hours
I	**INTRODUCTION AND CONCEPTS:** Different types of problematic soils, their geological formations, selection of ground improvement techniques based on soil conditions, objectives of ground improvement techniques, diff. types of stabilizations. DRAINAGE & DEWATERING- Well point system, vaccum dewatering system, Deep well drainage, electro-osmosis.	9
II	**TREATMENT OF LOOSE SAND-** Compaction pile,vibroflotation, dynamic Compaction. **TREATMENT OF EXPANSIVE SOIL**- Lime & cement stabilization, chemical Analysis. **TREATMENT OF SOFT CLAY SOILS**- Sand drains & its design criteria, Stone columns, preloading & surcharge fill dynamic consolidation.	9
III	**GROUTING TECHNIQUES & MATERIALS –** Permeation grouting, jet grouting, grouting equipments, diff. types of grouting materials Bentonite- cement mixes, asphalt etc., grout monitoring system, grouting in different conditions.	9
IV	**GEOSYNTHESITIC APPLICATIONS-** Geotextiles& geomembanes, reinforced soil structures, base isolations, temporary supporting systems etc.	9
V	**GROUND IMPROVEMENT FOR SLOPES-** Soil nailing, anchoring, prestessed anchors, design methods & construction techniques. **CASE STUDIES**- Case studies of different ground improvement project in India.	9

REFERENCES:

1. Dr.B.C.Punmia- Soil Mechanics & Foundation- Laxmi Publication Pvt. Ltd. Delhi.
2. Dr.K.R.Arora-Soil Mechanics & Foundation Engineering-Standard Publisher Distributor Delhi.
3. Hausmann H.R.- Principles of ground modification- Mcgraw Hill book co.
4. Shashi K.Gulati & Manoj Dutt- Geotechnical Engg- Tata Mcgraw Hill Education pvt.ltd. New Delhi.
5. Koemer R.M.- Construction & geotechnical methods in foundation Engineering- Tata Mcgraw Hill New Delhi.
6. P. Purushottam Raj-Ground improvement techniques- Laxmi Publication Pvt. Ltd.

Delhi.

Programme Elective III - B.E. Civil Engineering, VII Sem

COURSE CODE: CE -705 COURSE: ADVANCED RCC DESIGN

Course scheme					Evaluation scheme (Theory)				
lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper hour	MSE	IE	ESE	Total
3	1	-	4	3	3 Hr	10	10	80	100

Unit	CONTENTS	Hours
I	Analysis and design of Multistoried buildings up to three bays, calculation of loads, Approximate analysis, Preliminary sizing, IS:875, IS:1893 recommendations, Ductile detailing.	9
II	Analysis and Design of Elevated service Reservoirs, IS Recommendations for wind & earthquake, Ductile detailing.	9
III	Analysis and Design of bridges and Culverts. IRC Recommendations.	9
IV	Analysis and design of Silos and Bunkers. IS recommendations.	9
V	Analysis and Design of raft foundations, Pile foundations, single pile, group of piles, Pile cap.	9

REFERENCES:

1. Bhavikatti S. S., Advanced R. C. C. Design Volume-I & II, New age international publisher, New Delhi.
2. Krishna Raju N, Advanced R. C. C. Design, CSB Publisher and Distributor, New Delhi.
3. B.C. Punmia, Ashok K. Jain, Arun K. Jain – Reinforced Concrete Structures Vol. II, Laxmi Publications, New Delhi
4. N.C. Sinha, S.K. Roy – Fundamentals of Reinforced Concrete, S. Chand & Co. Ltd, New Delhi
5. P.C. Varghese – Advanced Reinforced Concrete Design, Prentice Hall of India Pvt. Ltd., New Delhi.
6. P. C. Varghese, Design of Reinforced concrete Foundation. PHI Learning Pvt. Ltd.
7. Ramachandra, Design of Concrete Structures Vol. I & II. Standard Book House.
8. Reinforced Concrete design ---Dr.H.J.Shah—Charotar publishing house
9. Design of R.C.C—S.Ramaamruthum -- Dhanpat Rai publications
10. Ramakrishnan and P.D.Arthur, ―Ultimate Strength design for structural concrete‖, Wheeler Publishing Co.
11. Karve S.R. and Shah V.C, ―Design of reinforced cement concrete structures using Limit State Approach‖, Structures Publishers.

12. Jain O.P and Jaikrishna, ―Plain and reinforced concrete‖, Vol-II, Nemchand and Bros

13. IS: 456-2000 Indian Standard code of practice for plain and reinforced concrete, Bureau of 24/44 Indian Standards, New Delhi.

14. IS: 1893:-2002 Indian Standard Code of practice for criteria for Earthquake resistant design of Structures, Bureau of Indian Standards, New Delhi.

15. IS: 3370-Indian Standard code of practice for concrete structures for storage of liquids, Bureau of Indian Standards, New Delhi

Programme Elective III - B.E. Civil Engineering, VII Sem

COURSE CODE: CE -706 COURSE: REMOTE SENSING & GIS

Course scheme					Evaluation scheme (Theory)				
lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper hour	MSE	IE	ESE	Total
3	1	-	4	3	3 Hr	10	10	80	100

Unit	CONTENTS	Hours
I	**INTRODUCTION AND CONCEPTS:** Introduction of Remote Sensing –Definition, stages of remote sensing, Energy sources and Radiation principles, Energy equation, EMR and Spectrum, EMR interaction with Atmosphere scattering, Absorption, EMR interaction with earth surface features reflection, absorption, emission and transmission, Spectral response pattern , vegetation, soil, water bodies- Spectral reflectance. Active, Passive, Optical Remote sensing, visible, infrared, thermal, sensors and characters. Ideal remote sensing system – Characters of real and successful remote sensing system.	9
II	**AERIAL PHOTOGRAPHY AND PHOTOGRAMMETRY** Introduction-Terrestrial and Aerial photographs, vertical and oblique photographs, height determination contouring, photographic interpretations, stereoscopy, parallax bar, Flight Planning, Photo Interpretation, Applications of aerial Photos.	9
III	**SATELLITE REMOTE SENSING PRINCIPLES AND IMAGE ACQUISITION AND DATA FORMAT:** Data acquisition–Procedure, Reflectance and Digital numbers- Intensity, Reference data, Ground truth, Analog to digital conversion, Detector mechanism, Spectro- radiometer. Platforms and sensors- orbits types – Resolution. Satellite data acquisition, DN characters-kernels- storage devices, CC, CDisk, Optical disk. Data retrieval. Export and import, Data formats, BSQ, BIL, BIP, Run length encoding, Image Compression Data products.	9
IV	**REMOTE SENSING SATELLITES:** Land observation satellites, characters and applications, IRS series, LANDSAT series, SPOT series, High resolution satellites, character and applications, CARTOSAT series, IKONOS Series, QUICKBIRD series, Weather/Meteorological satellites, INSAT series, NOAA, GOES, NIMBUS Applications, Marine observation satellites OCEANSAT. Microwave remote sensing Sensors, Concept of Microwave remote sensing, SLAR, SAR Scattrometers, Altimeter, Characteristics, Image interpretation characters.	9

V	**BASICS OF GIS** Introduction, concepts , Information system , components of GIS, History, Geospatial data architecture, Operations, Geographic co ordinate systems, Map projections, concepts, Input data for GIS , display ,types of output products. GIS categories, Level and scale of Measurement, importance of data quality.	**9**

REFERENCES:

1. A.M. Chandra and S.K. Gosh, Remote Sensing and GIS, Narosa Publishing Home, New Delhi 2009.
2. Burrogh P.A., Principles of Geographical Information System, Oxford Publications, 1986.
3. George Joseph, Fundamentals of Remote Sensing Universities Press, Hyderabad 2005.
4. Kang tsung Chang, Introduction to Geographical Information System, Tata McGraw Hill, 7th edition, 2010.
5. M. Anji Reddy, Textbook of Remote Sensing and Geographical Information systems, BS Publications, Hyderabad. 2011.
6. Thomas M. Lillesand, Ralph W. Kiefer, Jonathan W. Chipman Remote sensing and image interpretation John Wiley & Sons, 2008.

Programme Elective III - B.E. Civil Engineering, VII Sem

COURSE CODE: CE - 707 COURSE:ADVANCED SOIL MECHANICS

Course scheme					Evaluation scheme (Theory)				
lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper hour	MSE	IE	ESE	Total
3	1	-	4	3	3 Hr	10	10	80	100

Unit	CONTENTS	Hours
I	**Clay minerology** : Concept of composition classification and nomenclature, structure of clay minerals, Kaolinite Illite, Montmorillonite groups physical properties, clay water relation thixotrophy electrical effects, electrosmossis, streaming potential Zeta potential. **Drainage and Dewatering** : Various systems of and there Graded filters and design Criteria applications of Geomembranes	7
II	**Expansive Soils** : Identification and classification Measurement of swelling pressure (vertical) and potential Foundation problems, different types of foundation design principles Latest technique to tackle expansive nature.	9
III	Compaction & field compaction and controls : Mechanics, Lab & Fd. Tests, Fd. Compaction equipments & these choice and suitability, quality control, Deep compaction, Vibro floatation.	11
IV	Consolidation : Terxaghi's theory for two & three dimensional consolidation field and laboratory tests. Consolidation settlements and drains.	8
V	Soil stabilization, Mechanical and Chemical stabilization, Lab. & Investigations, Field Techniques, Advanced Techniques in Geotextile 89 applications, Stone columns and Gabions. Case studies of Applications	10

Recommended Books:

1. Soil Mechanics in Theory & Practice, Author Alam Singh, Publisher Asia Publishing House Edition 1975 & later
2. Geotechnical Engineering Author S. K. Gulhati & Manoj Dutta Publisher Tata McGraw-Hill Edition 2005
3. Geotechnical Engineering Author Purushothama Raj Publisher Tata McGraw Hill Publishing Co. Ltd. Edition 1995
4. Soil Mechanics & Foundation Engg Author Punmia B.C. Publisher Laxmi Publication Pvt. Ltd, New Delhi, Edition 1994
5. Geotechnical Engineering Author C. Venkatramaiah Publisher New Age International Ltd. Edition (Second Edition) 1995
6. Basic & Applied Soil Mechanics Author Gopal Ranjan & A.S. RAO;, Publisher New Age InternationalLtd, Edition 2004.

Programme Elective III - B.E. Civil Engineering, VII Sem

COURSE CODE: CE -708 **COURSE: Advanced Hydraulic Structures**

Course scheme					Evaluation scheme (Theory)				
lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper hour	MSE	IE	ESE	Total
3	1	-	4	3	3 Hr	10	10	80	100

Unit	CONTENTS	Hours
I	**DESIGN OF WEIRS AND BARRAGES OVER PERMEABLE FOUNDATIONS :** Causes of failure, Bligh's and Lane's creep theory, Khosla's theory and method of independent variables, standard profiles, corrections, exit gradient, plotting of HGL, Design of d/s and u/s protection works, length of pucca concrete floor	9
II	**SPILLWAYS :** Necessity, components and classification, Estimation of spillway design flood, Energy dissipators and its applications **CANAL FALLS :** Types and design principles	9
III	**CANAL REGULATION WORKS** : Alignment of offtaking channels, Distributaries, head regulator, cross regulator and their design, weir type and regulator type escapes, metering flumes, types of modules, Kennedy's gauge outlet	9
IV	**DESIGN CONSIDERATIONS FOR CROSS DRAINAGE WORKS :** Fluming the canal, Hind's method for design of transition, Design of pucca canal trough	9
V	**HYDRAULICS OF OUTLET WORKS :** Sluiceways, river intakes, simple submerged intakes, trash racks Preliminary concepts of design of stepped spillways and labyrinth weirs	9

REFERENCES:

1. Garg Santosh Kumar., Irrigation Engineering and Hydraulic Structures, John Khanna Publishers, New Delhi 2004.

2 Punmia B.C. and Pande B.B. Lal Irrigation and Water Power Engineering, Laxmi Publications Pvt. Ltd 2003

3. Design of Small Dams, U.S. Bureau Reclamation, Oxford and IBH Publication Co., New Delhi 1960

Programme Elective III - B.E. Civil Engineering, VII Sem

Course Code: CE -709 **Course: Advanced Prestressed concrete**

Course scheme					Evaluation scheme (Theory)				
lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper hour	MSE	IE	ESE	Total
3	1	-	4	3	3 Hr	10	10	80	100

Unit	Contents	Hours
I	Introduction, Prestressing Systems and Material Properties . Basic concepts of pre-stressing; Historical development; Advantages and Types of Prestressing. Pre-tensioning Systems and Devices, Post-tensioning Systems and Devices, Need for High strength steel and High strength concrete; Losses Of Prestress: Nature of losses of pre-stress; Loss due to elastic deformation of concrete, shrinkage of concrete, creep of concrete, relaxation of stress in steel, friction and anchorage slip; Total losses allowed for in design.	9
II	Analysis of Prestressed Member. Analysis of Members under Axial Load: Analysis at Transfer, Analysis at Service, Analysis for Ultimate Strength, Analysis of Member under Flexure:, Analysis at Transfer and at Service, Cracking Moment, Kern Point, Pressure Line, Analysis for Ultimate Strength, design loads and strength, Calculation of Crack Width, Variation of Stress in Steel, Analysis of a Rectangular Section, Analysis of a Flanged Section.	9
III	Deflections of Prestressed Concrete Members . Importance of control of deflections; Factors influencing deflections; Short term deflections of uncracked members. Long term deflection of cracked member; Transmission Of Pre-Stress: Transmission of Pre-stressing force by bond; Transmission length; Bond stresses; Transverse tensile stresses; End zone reinforcement; Flexural bond stresses in pre –tensioned and post –tensioned grouted beams, stress distribution in end block, Anchorage zone reinforcements. Shear And Torsion Resistance Of Prestressed Concrete Member. Shear and Principal stresses; Ultimate shear resistance of pre-stressed concrete members; Design of shear reinforcement, pre-stressed concrete members in torsion, Design of reinforcements for torsion, shear and bending.	9
IV	Design of Pre-Stressed Members Design of sections for flexure, Design of Sections for Axial Tension, Design of Sections for compression and bending, design of pre-stressed section for shear and torsion, design of prestressed member for bond. Dimensioning of flexural member, design for pre-tensioning member, design of post-tensioning members.	9

V	Composite Construction of Prestressed Concrete. Composite structural member, types of composite construction, analysis of stresses, differential shrinkages, deflection of composite member, flexural strength of composite sections, shear strength of composite section. Design of Continuous Prestressed Concrete Member. Advantages of continuous members, ultimate load analysis of continuous pre-stressed member, design of continuous pre-stressed concrete beams.	**9**

REFERENCES:

1. Prestressed Concrete by N. Krishna Raju; Tata Mc Graw -Hill Publishing Company Limited, New Delhi.3rd edition, 1995.

2. Design of Prestressed Concrete Structures by T.Y. Lin & Ned H. Burns; John Wiley & Sons, 3rd edition, 1981.

Programme Elective III - B.E. Civil Engineering, VII Sem

Course Code: CE -712 COURSE: ADVANCED RCC DESIGN(PRACTICAL)

Course scheme					Evaluation scheme (Practical)		
lecture	Tutorial	Practical	Periods/week	Credits	TW	POE	Total
-	-	3	3	2	25	25	50

Any three detailed design and drawing from above five units.

Minimum three design assignments based on theory syllabus along with the detailed structural drawings on A1size sheets.

Practical Examination shall be based on the above Practical work.

Programme Elective III - B.E. Civil Engineering, VII Sem

Course Code: CE -713 Course: REMOTE SENSING & GIS PRACTICAL

Course scheme					Evaluation scheme (Practical)		
lecture	Tutorial	Practical	Periods/week	Credits	TW	POE	Total
-	-	3	3	2	25	25	50

Any ten from the following practical to be performed:

1. Testing stereo vision.
2. Use of Lens stereoscope and Mirror stereoscope.
3. Determination of vertical exaggeration.
4. Use of Parallax Bar for height calculation from aerial photographs.
5. Calculation of scale of the photographs.
6. Marking Principal point and conjugate principal point on the stereo pairs.
7. Study of Image analysis software.
8. Study of GIS software.
9. Creating and editing a shape file from Microsoft Excel file.
10. Spatial analysis with raster data.
11. Geometric correction of raw images.
12. Mosaic of images.
13. Subset creation using ERDAS.
14. Unsupervised classification of Images.
15. Supervised classification of images.
16. GCP collection using GPS.

Programme Elective III - B.E. Civil Engineering, VII Sem

COURSE CODE: CE - 714 **COURSE: ADVANCED SOIL MECHANICS**

Course scheme			Evaluation scheme (Theory)		
Practical	Periods/week	Credits	Term work	POE	Total
3	3	2	25	25	50

Any five practical to be performed

1. Particle size analysis by
    i. Hydrometer method
    ii. Pipette method
2. Determination of free swell value and differential swell value of a given soil.
3. Determination of swelling pressure of soil.
4. Determination of compaction characteristics of soil by modified Proctor test.
5. Determination of pre-consolidation pressure of soil.
6. Determination of Co-efficient of consolidation of given soil.
7. Chemical stabilization
    i. Soil with cement
    ii. Soil with lime.
    iii. Soil with lime plus flyash.
8. Mechanical stabilization- blending of soil.
9. Case study(any one).

Programme Elective III - B.E. Civil Engineering, VII Sem

Course Code: CE -715 **Course: Design of Hydraulic Structures**

Course scheme					Evaluation scheme (Practical)		
Lecture	Tutorial	Practical	Periods/week	Credits	TW	POE	Total
-	-	3	3	2	25	25	25

Any Three from the following practical to be performed:

1. Analysis, Design and Drawing of Spillways with All details
2. Analysis, Design and Drawing of Weir with All details
3. Analysis, Design and Drawing of Barrage with All details
4. Analysis, Design and Drawing of Canal Fall with All details
5. Analysis, Design and Drawing of Canal Regulation Work with All details

Programme Elective III - B.E. Civil Engineering, VII Sem

Course Code: CE -716 **Course: Advance Prestressed Concrete**

Course scheme					Evaluation scheme (Practical)		
lecture	Tutorial	Practical	Periods/week	Credits	TW	POE	Total
-	-	3	3	2	25	25	50

1. Design and Experimental study of pre-tensioned concrete element in laboratory.

2. At least one Site visit and preparation of detailed report and a seminar on it.

Course Code: CE -717 **Course: Industrial case study**

Course scheme					Evaluation scheme (Practical)		
lecture	Tutorial	Practical	Periods/week	Credits	TW	POE	Total
-	-	3	3	2	25	25	50

Term work should consist of any two case studies of Civil Engineering live projects and at least one seminar along with its report in spiral binding form for each case study

Course Code: CE -718 **Course: Project phase-I**

Course scheme					Evaluation scheme (Practical)		
lecture	Tutorial	Practical	Periods/week	Credits	TW	POE	Total
-	-	3	3	2	50	50	100

Project phase-I shall consist of

1. Finalization of topic
2. Review of literature
3. Synopsis with complete outline of thesis
4. Data collection if any
5. Analysis phase-I
6. Minimum Two seminars based on above work.

The project work will be a design project – experimental project – field surveying or computer oriented on any of the topics of Civil Engineering interest. It will allot as a group project consisting of a minimum THREE and maximum Six number of students, depending upon the depth of project work. The student is required to do literature survey, formulate the problem and form a methodology of arriving at the solution of the problem. The term work assessment of the project will be done at the end of the semester by a committee consisting of three faculty members from the department along with Project Guide. The students will present their project work before the committee. The complete project report is not expected at the end this semester. However a Ten pages typed report based on the work done will have to be submitted by the students to the assessing committee. The project guides will award the marks to the individual students depending on the group average awarded by the committee. One Project Guide will be allotting Maximum TWO group for guidance.

B.E. Civil Engineering-VIII Sem

Course Code: CE - 801 **Course: Quantity Surveying and Estimation**

Course scheme					Evaluation scheme (Theory)				
lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper hour	MSE	IE	ESE	Total
3	01	-	04	04	4 Hr	10	10	80	100

Unit	CONTENTS	Hours
I	(a) Importance, purpose of quantity estimate, Mode and unit of measurement as per I.S.1200. Method and stages of estimates. Item of work and Description of an item of work. Approximate estimation of Civil Engineering works. (b) Proposal and Development of project, Nature of contract between owner &Architect/Engineer, Duties & liabilities of Architect/Engineer, Architect /Engineers normal professional services, various important terminology required like work charge establishment ,muster roll, contingencies, cent age charges, measurement book, overheads etc.	10
II	Quantity & cost estimates. (a) Methods of detailed estimates, forms used for detailed estimates, working out the quantities of various materials required for construction of various Civil Engineering works such as Building, culverts, hydraulic structure, water supply & sanitary works, road works, retaining walls , water tanks etc. (b) Earthwork estimates in road (including hill road), canals etc. (c) Detailed estimate of steel in RCC works, bar bending schedule.	08
III	Specifications: Purpose & principles of specifications. Types of specification, Developing detailed specifications of important items. Cost build up: purpose & principles, Importance of Current schedule rates (CSR) in cost estimate, factors affecting analysis of rates, information from National building organization. Task work, factors affecting task work, Markets rates escalation.	09
IV	Arranging works: P.W.D.as the construction agency, method of carrying out works, arranging contract works, pretender & contract planning, tender notice, acceptance of tender, essentials of contract, type of	08

	contract, conditions of contract, contract documents, various schedules in tender documents, measurement & payment to contractor, Indian contract law, and the Engineering contract, Land acquisition act, legal aspects of various contract provisions, arbitration.	
V	Valuation: purpose of valuation, Factors affecting value of property price & cost, market value, potential value, sentimental value, scrap value, reversionary value etc. Real Estate, net & gross return, tenure of land, valuation of land, free hold & lease hold , sinking fund, depreciation , capitalized value, methods of valuation, differed annuity, Time-cost relationship, valuation tables, rent fixation. Cost accounting: various methods classification of cost, direct & indirect charges, distribution of overheads, M.A.S.Account, issue rates & store account.	10

REFERENCES

1. Estimation & Costing by B.N.Dutta UBS Publications Distribution (P) Ltd.
2. Estimation & Costing (civil) by D.D.Kohli& Ar.R.C.Kohali(S.chand & company pvt.ltd.)
3. Estimating construction costs by Robert L.Peurify&Garold D.Oberlender ,Tata McGraw-Hill .
4. Construction Planning & Management by P.S.Gahalot & B.M.Dhir, New age International (P) Ltd. Publication.

Questions paper Pattern:

*0ne compulsory question on building estimate.

B.E. Civil Engineering-VIII Sem

Course Code: CE – 809 **Course: Quantity Surveying And Estimation**

Course scheme Evaluation scheme (LABORATORY)

Course scheme					Evaluation scheme (Practical)		
lecture	Tutorial	Practical	Periods/week	Credits	TW	POE	Total
-	-	3	3	2	25	25	50

The candidate shall submit 08 experiments from the following.

1. Detailed building estimate of load bearing structure & framed structure
2. A complete set of contract document including specifications.
3. Detailed estimate road work .
4. Rate analysis of 10 major item of building.
5. Specification of 10 major item of building.
6. Valuation & rate fixing.
7. Calculation of reinforcement in RCC with bar bending schedule.
8. Study of IS-1200.
9. Expert lecture by legal advisor on various legal aspects of contracts & report by students.
10. Site visit to: Study of schedule of rates & comparison with market rates & report by the students.

Practical Examination shall consist of written test & viva-voce based on the syllabus & sessional work.

B.E. Civil Engineering, VIII Sem

COURSE CODE: CE -802 COURSE:TRANSPORTATION ENGINEERING II

Course scheme					Evaluation scheme (Theory)				
lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper hour	MSE	IE	ESE	Total
3	1	-	4	3	3 Hr	10	10	80	100

UNIT	TOPICS	HOURS
I	**Railway Engineering :** Permanent way, gauges, coning of wheels and tilting of rails.Rail types, wear and failure.Sleepers, rail Fixtures and fastening, ballast cushion.Traction and Tractive resistance, hauling capacity and tractive effort of locomotives.	5
II	Geometric design of railway track, Gauge, Gradients speed, super elevation cant deficiency Negative super elevation, curves, length of transition curves, grade compensations. Points of crossings : Left and right hand turnout, design calculations for turnout & Crossover, railway track functions. Station and Yards: Types, functions facilities & equipment.	12
III	Railway track construction,study of ballast less & magley tracks inspection & modem, techniques, of maintenance. Push through Technique. **Tunnel Engineering :**Tunnel alignment-Tunnel Surveys,Tunneling methods in Hard Rock and Soft Grounds,Tunnel lining. Drainage, Ventilation and lighting of tunnels, Advances in Tunneling&Tunnel Boring Mechanics, Case studies.	8
IV	**Airport Engineering :** Aircraft characteristics, Airport site Selection. Modem aircrafts.Airport obstructions: Zoning Laws, imaginary surfaces, Approach and turning Zone, clear zone, vert. Clearance for Highway &Railway. Runway and taxiway design: Windrose, cross wind component, Runway Orientation and configuration. Basic runway length and correction, runway geometric design standards. Taxiway Layout and exit taxiways.	9
V	**Airport layout. Airport classification:** Terminal Area Aircraft parking & parking system. Unit terminal concept, Aprons,	11

	Hangers, internationals Airports layouts, phase development. Visual Aids: AirPort marking and Lighting for runway, Taxiway and other areas.Air traffic control: Need, network, control aids, instrumental landing systems, advances in air traffic controls.	

Text Books :

1. Railway Engineering : Saxena and Arora, DhanpatRai& Sons
2. Airport Engineering : Khanna and Arora, Nem Chandra & Brothers, Roorkee.
3. Tunnel Engineering : S. Srinivasan, Publishing House Charotar.

Reference Book :

1. Airport Engineering : G.Venkatappa Rao, Tata Mc.Graw-Hill Publishing
2. Planning and Design of Airports : Robert Herorjeff, Mc.Graw-Hill Publishing
3. Railway Tracks Engineering : J.S.Mundrey, Tata Mc.Graw-Hill Publishing
4. Introduction to Tunnel Construction : David Chapman, Nicole Metje, Alfred Stark, Span Press, New York.

B.E. Civil Engineering, VIII$_{th}$ Sem

COURSE CODE: CE - 803 **COURSE: PAVEMENT DESIGN**

Course scheme					Evaluation scheme (Theory)				
lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper hour	MSE	IE	ESE	Total
3	1	-	3	3	3 Hr	10	10	80	100

Unit	CONTENTS	Hours
I	**General:** Pavement design factors, components of flexible and rigid pavement and their functions, characteristics of highway and airfield pavement. **Design parameters:** Design wheel load, Standard axle load and wheel assemblies for road vehicles. Under carriage system for aircraft, tyre and contact pressure, contact area, imprints, computation of ESWL for flexible and rigid pavements. Load repetitions and distributions of traffic for highway and airfield, pavement, airport traffic areas, Serviceability concept.	7
II	**Material characteristics:** AASHO subgrade soil classification, CBR test, North Dakota cone bearing value, plate load test for K-value, modulus of elasticity and Poisson's ratio of subgrade soils, Marshall's method of Bituminous mix design, Surface dressing, Premix carpet, Mix seal surfacing , Semi-dense carpet, Asphaltic concrete, Bituminous Macadam Binder course, Dense Bituminous Macadam Binder course, Modulus of rupture, modulus of elasticity, Poisson's ratio and coefficient of thermal expansion of concrete, Layer equivalent concepts.	9
III	**Analysis of flexible and rigid pavements**: Stress, strain, deflection analysis one layer system by Boussinesq's,Two,three layer system by Burmister's,and multi layered flexible pavement system. Stress and deflections for rigid pavements due to load and temperature, influence charts, ultimate load analysis joints. **Highway Pavement Design:** Flexible: North Dakota cone, Design using the latest IRC code, Triaxial (Kansas), AASHTO method of design. Rigid: Design using the latest IRC code, PCA, AASHTO method of design, design of joints and reinforcements	11
IV	**Airfield pavement design:**	8

	a) Flexible: FAA, US Corps of engineering, CBR, Mcleod (Canadian) b) Rigid :FAA, PCA& LCN,definitions of ACN, PCN, LCN. Calculation of LCN value. Ultimate load analysis and yield lines patterns method	
V	**Pavement testing and evaluation:** field density, CBR, plate load test,Pavement Failures in both Flexible Pavement & Rigid Pavement - types and causes, condition surveys and surface evaluation for unevenness, rut depth, profilometers, bump integrators, Benkleman beam deflection study. **Strengthening of pavements**: design of flexible, composite and rigid overlays for flexible and rigid pavements, repairs, maintenance and rehabilitation of pavements	**10**

Recommended Books:

1. Principles of Pavement Design by H.J.Yoder and Witczak, John wiley and sons.
2. Highway Engineering by Khanna O.P, Justo C.G., , Nem Chand Publishers
3. Pavement Analysis and Design by Yang H. Huang 2nd Edition, Pearson Education, Inc., Pearson Prentice Hall Company.
4. Airport Engineering by G VenkatappaRao, Tata McGraw –Hill Publishing Company Ltd.
5. IRC-37(Latest Code))Guide lines for Design of Flexible Pavement
6. IRC -58-(Latest code) Guide lines for Design of Plain Jointed Rigid Pavement for highways
7. MOST Specifications for Road and Bridge Works, 1994 (Third Revision)

Reference Books:

a. Airport Engineering by Khanna and Arora, Nemchand& Brothers.

B.E. Civil Engineering, VIII$_{th}$ Sem

Programme Elective – IV

Course Code: CE - 804 **Course: Experimental Stress Analysis**

Course scheme					Evaluation scheme (Theory)				
lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper hour	MSE	IE	ESE	Total
3	01	-	04	04	4 Hr	10	10	80	100

Unit	CONTENTS	Hours
I	Introduction to experimental stress analysis, advantages of ESA technique, Fundamental concept of strain measurement. Development of ERSG, types, construction and material, Gauge sensitivity and gauge factor, transverse sensitivity, correction for transverse strain effect, Grid, Backing material, Adhesive, Mounting method, checking gauge installation, Performance characteristics of foil strain gauge, linearity, hysteresis, zero shift, environmental effect, moisture proofing.	10
II	Wheatstone bridge circuit, sensitivity, types, balancing of bridges, constant current circuit, Transducer application, diaphragm pressure transducer, displacement transducer, axial force transducer, bending force transducer, torque transducer.	08
III	Determination of principal strains, principal stresses, maximum shear stress and principal angles, three and four element rectangular rosette, delta rosette, tee rosette . General principles, advantages and disadvantages, state of stress and laws of failure, detection of cracks, types of brittle coating, test procedure, calibration technique.	09
IV	Basic optics related to photo elasticity, ordinary light, monochromatic light, polarized light, natural and artificial, Stress optic law in two dimensions at normal incidence, Material fringe value in terms of stress function	08
V	Plane polariscope, isoclinics, isochromatics, Circular polariscope, different arrangements, isochromatics, Fractional fringe measurement, Tardy's method , Babinet Soleil method, Selection and properties of model materials, Calibration methods, circular disc, tensile specimen, Separation methods, oblique incidence method, shear difference method	10

REFERENCES

1. Experimental stress analysis by Dailly and Riley, McGraw Hill
2. Experimental stress analysis by Dr. Sadhu Singh, Khanna Publications
3. Experimental stress analysis by Holister Dove and Adams.
4. Photoelasticity Vol. I by Frecht
5. Applied stress analysis by Direlli
6. The strain gauge primer by Perry Listner

B.E. Civil Engineering, VIII$_{th}$ Sem

Programme Elective – IV

COURSE CODE: CE 805 COURSE: ADVANCED DESIGN OF STEEL STRUCTURES

Course scheme					Evaluation scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper hour	MSE	IE	ESE	Total
3	1	0	4	4	4	10	10	80	100

UNIT	CONTENT	HOUR
1	Analysis and design of industrial building with roof truss. Calculation of wind and earthquake forces. Gable frame with and without haunch IS code provision of IS 800-2007	**12**
2	Deign of overhead tank, pressed steel tank. Wind load calculation. Steel staging and its RCC foundation	**10**
3	Analysis and design of steel chimney. Wind load and earthquake load calculation, Maximum base shear. Design of foundation.	**10**
4	Design of Bridges, IRC loading, Deck and through Bridges, Moving load , plate girder and truss girder bridges.	**13**

References Books and I. S. Codes

1. Ram Chandra, Design of steel Structures, Volume II, Standard Book House, Delhi.
2. Punmia and Jain, Comprehensive Design of steel structure, Laxmi Publication, Delhi.
3. M Raghupathi, Design of steel structures, Tata McGraw Hill, New Delhi. 10/44
4. S K Duggal, Limit state design of steel structures, Tata McGraw Hill Education.
5. N Subramanian, Design of steel structures, Oxford University Press.
6. Sarwar Alam Raz—Structural Design in Steel---New Age International Publishers
7. IS: 800 - 2007, Code of Practice for General Construction in Steel, BIS, New Delhi.
8. IS: 800 - 1984, Code of Practice for General Construction in Steel, BIS, New Delhi.
9. IS: 801 - 1975, Code of Practice for use of cold formed light gauge steel structural members in general building construction, BIS, New Delhi.

B.E. Civil Engineering, VIII$_{th}$ Sem
Programme Elective – IV

COURSE CODE: CE -806
COURSE: WATER TRANSMISSION AND DISTRIBUTION SYSTEM

Course scheme					Evaluation scheme (Theory)				
lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper hour	MSE	IE	ESE	Total
3	1	-	4	4	3 Hr	10	10	80	100

UNIT	TOPICS	HOURS
I	General Hydraulic Principles: Frictional head loss in pipes, different formulae, minor head loss in pipes, equivalent pipe Reservoir, Pumps and Valves: Impounding reservoir, Service and balancing reservoir, Three reservoir system, Multi reservoir system, pumps and pump co-ordinations, Valves- their types, Analysis of reservoir system with checks valves and pressure reducing valves.	6
II	Reservoir capacity: Estimation of minimum required reservoir capacity using graphical and analytical method. Design of pumping main: Optimal design of pumping main considering pipe diameter as continuous and discrete variable.	12
III	Analysis of Water Distribution Networks: Types and parameters, Parameter relationship, Formulation of equations, Analysis of network using Hardy Cross method, Newton Raphson method and linear theory method.	9
IV	Node Flow Analysis (NFA): Difference between Node Head and Node Flow Analysis, Necessity of NFA, Bhave's approach- Node classification, node category compatibility, NFA theory. Design of Water Distribution Networks: Design of single source branching networks using critical path method, number of branching, configuration of looped networks using Graph Theory principles, selection of branching configuration using path concept and minimum spanning tree concept. Design of single source looped networks using critical path method.	10
	Optimal Design Water Distribution Networks: Cost Head Loss Ratio (CHR) method- CHR criterion, Problem formulation, CHR	8

V	methodology for single source branching networks. Linear programming formulation and solution using simplex method.	

Text Books :

1. Bhave P.R and Gupta (1991), "Analysis of flow in water distribution networks", Technomic Publishing Co. Lancaster, Pennsylvania, USA.
2. BhaveP.R , " Design of Water Distribution Networks" networks"Technomic Publishing CO. Lancaster, Pennsylvnia,USA.

Reference Books :

1. Jeppaon R.W.(1977), "Analysis of Flow in Pipe Networks" Ann Arbor Science. Ann Arbor Michigan, USA.
2. Walski. T.M.(1984)," Analysis of flow in water distribution networks"Technomic Publishing CO. Lancaster, Pennsylvnia,USA.

COURSE CODE: CE -807

COURSE: DESIGN OF WATER AND WASTE WATER TREATMENT

Course scheme					Evaluation scheme (Theory)				
lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper hour	MSE	IE	ESE	Total
3	1	-	4	4	3 Hr	10	10	80	100

UNIT	TOPICS	HOURS
I	Objective of water treatment, unit operation and unit processes, treatment flow, site selection for water treatment plant. Aeration: objective of aeration, types or aerators, design of cascade aerator, gas transfer, two film theory; spray aerator.	5
II	Coagulation- Flocculation: Theory of coagulation objectives, types of rapid and slow mixing devices (hydraulic and mechanical), factors affecting coagulation and flocculation, nature and types of chemical coagulants used in water treatment, coagulant and flocculent aids. Sedimentation: Theory of sedimentation, factors affecting, types of settling, analysis of discrete and flocculent settling, design of sedimentation tank and clariflocculators.	10
III	Filtration: mechanism of filtration, types of filters, design of rapid sand filters, filter media specifications, preparation of filter sand from stock sand, problems in filtration. Disinfection: Method of disinfection, kinetics of disinfection, types of disinfectants, Chlorination, method of chlorination (breakpoint chlorination), factors affecting efficiency of chlorination.	8
IV	Treatment Methods: Waste water treatment flow sheet, preliminary, primary and secondary methods of treatment, design of screen. Girt chamber and primary settling tank.	12

V	Biological unit processes: principle of biological treatment processes, design parameters of activated sludge process and trickling filters. Aerated lagoons, stabilization ponds, Sludge treatment, aerobic and anaerobic digestion and sludge drying beds.	10

Books:

1. CPHEEO Manual of water supply & treatment
2. CPHEEO Manual on Sewerage & sewage treatment.
3. Water supply Engineering Vol I & II by B.C. Punmia — Laxmi Publication
4. Wastewater Engineering by Metcalf & Eddy – Tata McGraw Hill
5. Water supply & Sewage by M.S. Macghee, -- Tata McGraw Hill

B.E. Civil Engineering, VIII$_{th}$ Sem

Programme Elective – IV

Course Code: CE808 **Course: Application of System Engineering**

Course Scheme					Evaluation Scheme(Theory				
Lecture	Tutorial	Practical	Periods/Week	Credits	Duration of paper hour	MSE	IE	ESE	Total
03	01	03	04	04	03	10	10	80	100

Unit No.	Content	Hours
1	INTRODUCTION AND BASIC CONCEPT Introduction, System Components, Planning and Management Concept of a System, Advantages and Limitations of a system Approach, Modeling of a various Problems in Civil. Optimization, Economics in Civil Engineering, Challenges in Water sector. INTRODUCTION TO OPTIMIZATION. Objective function, Maxima, minima saddle points, convex and concave functions. Constrained and unconstrained optimization using calculus Lagrange multipliers, Kuhn-Tucker Condition.	06
II	LINEAER PROGRAMMING AND APPLICATIONS General form of LP, Standard and Canonical forms of LP, Elementary transformations. Graphical method, Feasible and infeasible solutions. Simplex method, Dual and Sensitivity Analysis. LP problem formulation, Reservoir sizing and Reservoir operation using LP.	10
III	DYNAMIC PROGRAMING AND APPLICATIONS Introduction, Multistage decision problem, Recursive Equations, Principle of optimality, Discrete DP, curse of Dimensionality., Water allocation problem., Capacity expansion problem., Reservoir operation., Multipurpose reservoir operation.	09
IV	MULTI-OBJECTIVE OPTIMIZATION Introduction, Non-inferior solutions, Trade of analysis, Pareto optimal solutions.Multipurpose reservoir operations. Weighted and constraint methods, Other methods., Review of probability theory., Uncertainty and reliability analysis. SIMULATION Introduction, River basin Simulation, Reservoir operation simulation,	10

	some simulation models	
V	River basin planning and management., Water Distribution systems, Groundwater systems, Water quality modeling., Floodplain management, Urban storm management ADVANCED TOPICS Fuzzy optimization, Genetic algorithms,Multi Criteria decision making, Decision support systems, Expert systems	10

References:

1. Loucks D.P, Stedinger J.R and Haith D.A, 'Water Resources Systems Planning and Analysis', Prentice Hall, USA, 1981.
2. Mays L.W and Tung Y-K, 'Hydrosystems Engineering and Management', McGraw Hill, USA, 1992.
3. Vedula S. and Mujumdar P.P., 'Water Resources Systems: Modelling Techniques and Analysis', Tata-McGraw Hill, 2005.
4. Jain S.K. and Singh V.P., 'Water Resources Systems Planning and Management', Elsevier, The Netherlands, 2003.
5. Loucks D.P. and van Beek E., 'Water Resources Systems Planning and Management', UNESCO Publishing, The Netherlands, 2005.
6. S.S. RAo "Engineering Optimization Theory and Practice " John Wiley & Sons, 20-Jul-2009

B.E. Civil Engineering, VIII$_{th}$ Sem

Programme Elective – IV

Course Code: CE – 810 **Course: Experimental stress analysis**

Course scheme Evaluation scheme (LABORATORY)

Course scheme					Evaluation scheme (Practical)		
lecture	**Tutorial**	**Practical**	**Periods/week**	**Credits**	**TW**	**POE**	**Total**
-	-	3	3	2	25	25	50

Term Work: Minimum ten of the following experiments to be performed

1 Study of electrical resistance strain gauge
2 Study of commercial strain indicator
3 Calibration of electrical resistance strain gauge. Determination of gauge factor Sg
4 Determination of unknown weight. Transducer application of strain gauge
5 Calculation of gauge factor and strain for single and two arm bridges.
6 Calculation of gauge factor and strain for four arms lateral and linear sensitive bridges.
7 Measurement by using commercial strain indicator and transducers.
8 Study of isoclinics and isochromatics and use of white light
9 Calibration of photo elastic model material. Determination of material fringe value.
10 Determination of fringe order by Tardy's method.
11 Separation of stresses by oblique incidence method.
12 Study of brittle coating method.

Practical Examination shall consist of written test & viva-voce based on the syllabus & sessional work.

B.E. Civil Engineering, VIII$_{th}$ Sem

Programme Elective – IV

COURSE CODE: 811 COURSE: ADVANCED DESIGN OF STEEL STRUCTURES

Course scheme Evaluation scheme (LABORATORY)

Course scheme				Evaluation scheme (LABORATORY)		
Lecture	Tutorial	Practical	Credits	TW	POE	Total
		3	2	25	25	50

LIST OF EXPERIMENTS

1. Minimum two designs on above syllabus and drawing on A 1 Size drawing sheet.

B.E. Civil Engineering, VIII$_{th}$ Sem

Programme Elective – IV

Course Code: CE – 812

Course: WATER TRANSMISSION AND DISTRIBUTION SYSTEM

Course scheme Evaluation scheme (LABORATORY)

Course scheme					Evaluation scheme (Practical)		
lecture	Tutorial	Practical	Periods/week	Credits	TW	POE	Total
-	-	3	3	2	25	25	50

Minimum 8 assignments based on following topics

1. Water distribution network analysis by Hardy cross method.
2. Water distribution network analysis by Newton Raphson method.
3. Water distribution network analysis by Linear theory method.
4. Water distribution network analysis by Gradient method.
5. Water distribution network analysis by Node flow analysis.
6. Design of water distribution network using critical path method.
7. Design of water distribution network using cost head loss ratio method.
8. Design of water distribution network using software TORA of Linear programming technique.
9. Design/ analysis of water distribution network with the application of software like Loop, Branch, EPANET, Water GEMS or Water CAD.
10. Conversion of Loop network into branch network using minimum spanning tree concept / Path length concept.
11. Pressure Dependant Demand (PDD) analysis of water distribution network.

B.E. Civil Engineering, VIII$_{th}$ Sem
Programme Elective – IV

Course Code: CE–813

Course: DESIGN OF WATER AND WASTE WATER TREATMENT SYSTEM

Course Evaluation scheme (LABORATORY)

Course scheme					Evaluation scheme (Practical)		
lecture	Tutorial	Practical	Periods/week	Credits	TW	POE	Total
-	-	3	3	2	25	25	50

Minimum five experiments

A)

1. Determination of sulphates
2. Determination of chlorides
3. Residual available chlorination and chlorine demand
4. Determination of BOD
5. Determination of COD
6. Jar test
7. Effective size and uniformity coefficient of filter sand
8. Bacteriological test (MPN Test)
9.

B) Design of individual unit of water or waste water treatment

B.E. Civil Engineering, VIII$_{th}$ Sem

Programme Elective – IV

Course Code: CE 814 Course- Application of System Engineering

Course Evaluation scheme (LABORATORY)

Lecture	Tutorial	Practical	Credits	TW	POE	Total
0	0	3	2	25	25	50

TERM WORK

Minimum Five Assignment based on theory syllabus along with the five problems to be solved by using MATLAB

Practical Examination shall be based on the above Practical work.

B.E. Civil Engineering, VIII$_{th}$ Sem

Course Code: CE – 815 **Course: PROJECT (PHASE –II)**

Lecture	**Tutorial**	**Practical**	**Credits**	**TW**	**POE**	**Total**
0	**0**	**6 hrs**	**6**	**100**	**100**	**200**

The project work started in the seventh semester will continue in this semester. The students will complete the project work in this semester and present it before the assessing committee. The term work assessment committee as constituted in the seventh semester will assess the various projects for the relative grading and group average. The guides will award the marks for the individual students depending on the group average. Each group will submit the copies of the completed project report signed by the guide to the department. The head of the department and college principal will certify the copies and return them to the students. One copy will be kept in the departmental library.