

Department of Civil Engineering

Dtd: 20.08.2022

Minutes of the BOS Meeting

Fifth BOS Meeting of Civil Engineering Department was held in online mode through Zoom platform (Meeting ID: 847 3592 7977) on 18.08.2022 at 10:30 AM in the presence of the following members.

Sl.No	Name	Designation	Role
1	Dr. G. Radhakrishnan	Professor, Head, Dept. of CE, SVEC, Pedatadepalli	Chairperson
2	Dr. P. Subba Rao	Professor and Director of Faculty Development Centre, JNTUK, Kakinada	Member and Subject Expert
3	Dr. C. B. Kameswara Rao	Professor of CE, NIT Warangal	Member and Subject Expert
4	Dr. M. Kumar	Professor of CE, Osmania University	Member and Subject Expert
5	Mr. Nagareddayya Subbagari	General Manager, Corporate QA/QC, M/S My Home Construction Pvt. Ltd., Hyderabad	Member and Industry Expert
6	Mr. T. Raj kumar	Research Scholar, Dept. of CE, NIT, Andhra Pradesh	Member and Alumni
7	Dr. CH. Rambabu	Professor of EEE and Dean, Student Affairs, SVEC, Pedatadepalli	Dean, Student Affairs
8	Mr. V. L. D. Prasad Reddy	Asst. Professor, Dept. of CE, SVEC	Member and Faculty of Civil Engineering
9	Mr. T Naga Seshu Babu	Asst. Professor, Dept. of CE, SVEC	Member and Faculty of Civil Engineering
10	Mr. B Hema Sundar	Asst. Professor, Dept. of CE, SVEC	Member and Faculty of Civil Engineering
11	Mr. K. Gowtham Kumar	Asst. Professor, Dept. of CE, SVEC	Member and Faculty of Civil Engineering

Following are the minutes of the BOS Meeting:

- The proposed course structure and syllabus of V, VI, VII & VIII semesters V20 Regulation is approved and the same have to be followed for the academic years 2022-23 and 2023-24.
- 2. Basic core courses should not be included in list of professional elective courses. Each professional Elective Course should contain advanced courses of all specializations.
- 3. Course Structure of V semester
 - Course related to Geotechnical Engineering specialization have to be included in the list of Professional Elective Course I
- 4. Course Structure of VI semester
 - Course related to Geotechnical Engineering specialization have to be included in the list of Professional Elective Course II
- 5. Course Structure of VII semester
 - The core course i) Estimation Specification and Contracts and ii) Construction Project Planning and Systems have to be excluded from the list of Professional Elective Courses arranged as a single Professional Core Course or Professional Core Course Lab.
 - Courses like i) PRECAST AND PREFABRICATED STRUCTURES ii) METRO SYSTEMS ENGINEERING iii) QUALITY ASSURANCE AND QUALITY CONTROL have to be included in the list of Professional Elective Courses
- 6. Course Structure of VIII semester
 - Project should contain practical hours of 24 to accommodate the allotted 12 credits.
 - To the possible extent project should carried from the field activity.
- 7. Syllabus have to designed keeping in view of GATE, IES and Public Service Commission exams
- 8. Knowledge Levels of higher order have to be maintained in the syllabuses of all courses.
- 9. Volume and Year of Publication of references and textbooks have to be included in syllabuses
- 10. NPTEL courses may also be included in Profession Elective Courses

- 11. Syllabus of V semester
 - Concept of MATRIX METHODS has to be included in the syllabus of Structural Analysis – II.
 - Concept of Green Concrete could be included in the syllabus of Advanced Concrete Technology
 - Rapid Chloride Permeability, Water Penetration Depth Test, Initial surface absorption, water, chloride and sulphate absorption tests could be included in Advanced Concrete Technology
 - Pedestrian paths, bicycle paths studies, sky walk planning and parking management could be included in Unit II of Traffic Engineering & Management course.
 - Level of service concept, Flexible Progressive System, Rotary Planning and Design as per IRC to be included in Unit IV of Traffic Engineering & Management course.
- 12. As a matter of completeness minor degree courses have to be announced.
- 13. Dept should contain licensed software's of courses mentioned under Skill Oriented Courses.

CHAIRPERSON OF BOS

<u>Vision</u>

<u>Mission</u>

To be a Department that strives towards quality education, research and consultancy in Civil Engineering.

<sup>To provide broad and high quality education to its students for a successful professional career.
To serve the construction industry through dissemination of knowledge and technical services to rural community and professionals.</sup>

[•]To inculcate ethics and human values, effective communication and leadership qualities among students to meet the challenges of the society.



I08818-284577, 284355 Ext: 321; Fax: 08818-284577 Visit us at: www.srivasaviengg.ac.in SRI VASAVI ENGINEERING COLLEGE (AUTONOMOUS)

(Sponsored by Sri Vasavi Educational Society) Approved by AICTE, New Delhi and Permanently Affiliated to JNTUK, Kakinada Pedatadepalli, **TADEPALLIGUDEM – 534 101,** W.G. Dist, (A.P.) **Department of Civil Engineering**

5th MEETING BOARD OF STUDIES

Agenda:

- **1.** Opening remarks by BOS Chairperson
- 2. Review of course structure for V,VI,VII & VIII semesters of B. Tech V20 Regulation

The proposed course structure of V,VI,VII & VIII semesters B.Tech under V20 Regulation is given in Annexure I.

- **3. Approval of syllabi for the courses offered in** V,VI,VII & VIII **semesters** The syllabi for various courses offered in V,VI,VII & VIII semesters B.Tech under V20 Regulation are given in Annexure II.
- 4. Approval of list of courses offering under Open Elective & Mandatory Courses in V,VI,VII & VIII Semesters to other branches and the approval of their detailed syllabi.

The details are given in Annexure III.

5. Any other item with the permission of chair.

CHAIRPERSON OF BOS

ANNEXURE - I <u>COURSE STRUCTURE APPROVED IN 2ND JOINT BOS MEETING (28/12/2020)</u> (For 2020 – 2021 Admitted Batch) – V20 Regulation

I SEMESTER

S.N	Course	Course Title	Hours per week			Credits	
0	Code	course mile	L	T	Р	Greatts	
1	V20MAT01	Linear Algebra and Differential Equations	3	0	0	3	
2	V20PHT01	Engineering Physics	3	0	0	3	
3	V20ENT01	English for Professional Enhancement	3	0	0	3	
4	V20MEL01	Engineering Graphics	1	0	4	3	
5	V20CST01	Programming in C for problem solving	3	0	0	3	
6	V20ENL01	Hone Your Communications Skills Lab-I	0	0	3	1.5	
7	V20PHL01	Engineering Physics Lab	0	0	3	1.5	
8	V20CSL01	Programming lab in C for problem solving	0	0	3	1.5	
9	V20CHT02	Environmental Studies	2	0	0	-	
		Total	15	0	13	19.5	

Total Contact Hours: 28

Total Credits : 19.5

II SEMESTER

S.N	V Course Course Title		Hours per week			Credit
0	Code		L	Т	Р	5
1	V20MAT02	Numerical Methods and Vector Calculus	3	0	0	3
2	V20CHT01	Engineering Chemistry	3	0	0	3
3	V20MET01	Engineering Mechanics	3	0	0	3
4	V20EET02	Basic Electrical and Electronics Engineering	3	0	0	3
5	V20MEL02	Engineering Workshop	1	0	4	3
6	V20EEL02	Basic Electrical and Electronics Engineering Lab	0	0	3	1.5
7	V20CHL01	Engineering Chemistry Lab	0	0	3	1.5
8	V20ENL02	Hone Your Communications Skills Lab-II	0	0	3	1.5
		Total	13	0	13	19.5

Total Contact Hours : 26

Total Credits : 19.5

COURSE STRUCTURE APPROVED IN 4^{TH} BOS MEETING (28/08/2021) III SEMESTER

S.N	Course	Course Title	Hours per week			Credit
0	Code		L	Т	Р	S
1	V20MAT04	Probability & Statistics (BOS of Maths)	3	0	0	3
2	V20CET01	Strength of Materials	3	0	0	3
3	V20CET02	Fluid Mechanics & Hydraulics	3	0	0	3
4	V20CET03	Surveying and Geomatics	3	0	0	3
5	V20CET04	Building Materials & Concrete Technology	3	0	0	3
6	V20CEL01	Strength of Materials Lab	0	0	3	1.5
7	V20CEL02	Surveying Lab	0	0	3	1.5
8	V20CEL03	Concrete Technology Lab	0	0	3	1.5
9	V20SOC01	Skill Oriented Course (Certificate course offered by Industries/Professional Bodies/APSSDC or any other accredited bodies)	1	0	2	2
10	V20ENT02	Professional Communication Skills-I (MNC) (BOS of Eng)	2	0	0	0
		Total	18	0	11	21.5

Total Contact Hours : 29

Total Credits : 21.5

S.N	Course	Course Title		ours j weel	Credit	
0	Code		L	Т	P	S
1	V20CET05	Engineering Geology	3	0	0	3
2	V20CET06	Structural Analysis - I	3	0	0	3
3	V20CET07	Water Resources Engineering	3	0	0	3
4	V20CET08	Transportation Engineering	3	0	0	3
		Managerial Economics Financial				
5	V20MBT51	Analysis	3	0	0	3
		(BOS of MBA)				
6	V20CEL04	Engineering Geology Lab	0	0	3	1.5
7	V20CEL05	FM & Hydraulic Machinery Lab	0	0	3	1.5
8	V20CEL06	Transportation Engineering Lab	0	0	3	1.5
		Skill Oriented Course (Certificate				
		course offered by				
9	V20SOC02	Industries/Professional	1	0	2	2
		Bodies/APSSDC or any other				
		accredited bodies)				
10	V20FNT03	Professional Communication Skills-	2	0	0	0
10	VZULINIUS	II (MNC) (BOS of Eng)	2	0	0	U
Total			18	0	11	21.5

Total Contact Hours : 29

Total Credits : 21.5

Internship for 2 months/Mini Project is mandatory during summer vacation and is evaluated in V semester.

COURSE STRUCTURE PROPOSED FOR APPROVAL IN <u>5TH BOS MEETING</u>

V SEMESTER

S.N	Course	Course Title	urse Title Hours per Credit		Credit	
0	Code		L	Τ	Р	S
1	V20CET09	Structural Analysis - II	3	0	0	3
2	V20CET10	Geotechnical Engineering	3	0	0	3
3	V20CET11	Design of Reinforced Concrete Structures	3	0	0	3
4	V20CET12 V20CET13 V20CET14 V20CET15 V20CET16	 Professional Elective Course I 1. Advanced Concrete Technology 2. Irrigation Engineering 3. Traffic Engineering & Management 4. Air Pollution and Control 5. Geo Environmental Engineering 	3	0	0	3
5		Open Elective Course I / Job Oriented Elective	0	0	6	3
6	V20CEL07	Geotechnical Engineering Lab	0	0	3	1.5
7	V20CEL08	Structural detailing using Auto CAD Lab	0	0	3	1.5
8	V20SOC03	Skill Advanced Course /Soft Skills Course	1	0	2	2
9	V20ENT04	Professional Communication Skills-III (MNC) (BOS of English)	2	0	0	0
10	V20CESI1	Summer Internship / Mini Project	0	0	0	1.5
Total 15 0 14 2						

Total Contact Hours : 27

Total Credits : 21.5

VI	SEMESTER
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S.N Course		Course Title		ours p week	Credit	
0	Code		L	Т	Р	S
1	V20CET17	Design of Steel Structures	3	0	0	3
2	V20CET18	Foundation Engineering	3	0	0	3
3	V20CET19	Environmental Engineering	3	0	0	3
4	V20CET20 V20CET21 V20CET22 V20CET23 V20CET23 V20CET24	 Professional Elective Course – II 1. Bridge Engineering 2. Earth Retaining structures 3. Urban Hydrology and Hydraulics 4. Pavement Analysis and Design 5. Remote sensing and GIS 	3	0	0	3
5		Open Elective Course – II/Job Oriented Elective	3	0	0	3
6	V20CEL09	Environmental Engineering Lab	0	0	3	1.5
7	V20CEL10	CAD & GIS Lab	0	0	3	1.5
8	V20CEL11	Estimation, Contracts and Construction Management Lab	0	0	3	1.5
9	V20SOC04	Skill Advanced Course /Soft Skills Course	1	0	2	2
10	V20CEMC 01	Intellectual Property Rights & Patents (MNC)	2	0	0	0
Total 18 0 11 2						21.5

Total Contact Hours: 30

Total Credits : 21.5

Internship 2 months / Mini Project is mandatory during summer vacation and is evaluated in VII semester.

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VII

S.N	Course	Course Title	Hours per week		Hours per week C		Hours per week	
0	Code		L	Τ	Р			
1	V20CET25 V20CET26 V20CET27 V20CET28 V20CET29	 Professional Elective Course III 1. Pre stressed Concrete 2. Advanced Foundation Engineering 3. Ground Water Development 4. Highway Construction and Management 5. Environmental Impact Assessment and Management 	3	0	0	3		
2	V20CET30 V20CET31 V20CET32 V20CET33 V20CET34	 Professional Elective Course IV 1. Finite Element Methods 2. Engineering with Geosynthetics 3. Urban Transportation Planning 4. Solid Waste Management 5. Prefabricated Structures 	3	0	0	3		
3	V20CET35 V20CET36 V20CET37 V20CET38 V20CET39	 Professional Elective Course V 1. Earthquake Engineering 2. Ground Improvement Techniques 3. Rural Water Supply and onsite sanitation Systems 4. Metro Systems and Engineering 5. Architecture and Town Planning 	3	0	0	3		
4		Open Elective Course III / Job oriented	3	0	0	3		
5		Open Elective Course IV / Job oriented	3	0	0	3		
6	V20MBT54	Humanities and Social Science Elective Universal Human Values-II (BOS of MBA)	3	0	0	3		
7	V20SOC05	Skill Advanced Course	1	0	2	2		
8	V20CESI2	Summer Internship / Mini Project Total	0	0	02	3 23		

Total Contact Hours : 23

Total Credits : 23

VIII SEMESTER

S.N	Course	Course Title		Hours J week		per K	Credit
0	Code		L	Т	Р	S	
1		Project work, seminar and internship in industry		0	0	24	12
Total 0 0 24						12	
Total Contact Hours: 0				Tot	al Cre	dits: 12	

Total Contact Hours: 0

Total Credits: 12

Skill Oriented Courses
1. Total Station
2. 2D Drafting & 3D Modeling
3. Building Planning and Drawing
4. Building Information Modeling
5. Revit Architecture Software
6. Advanced C
7. ETABS Software
8. Primavera Software

ANNEXURE – II <u>SYLLABI OF V to VIII SEMESTERS OF B.TECH COURSES FOR THE</u> <u>ACADEMIC YEAR 2022-23 & 2023-24</u>

V SEMESTER – SYLLABUS

Sem	V Sem	L	Т	Р	C	COURSE CODE	
Regulation	V20	3	0	0	3	V20CET09	
Name of the							
Course	SINULIURAL A		515 - 1	I I			
Branch	CIVIL ENGINEERING						

Course Outcomes:

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

- Compute the moments and reactions for two hinged and three hinged arches (K3)
- Analyze the continuous beams using Moment distribution and Kani's methods (K4)
- Assess the load distribution in different components of Suspension bridges (K3)
- Analyze the structure for Lateral loads using different methods (K4)
- Compute the moments and forces using matrix methods (K3)

SYLLABUS

UNIT I

Three Hinged Arches: Elastic theory of arches – Eddy's theorem – Determination of horizontal thrust, bending moment, normal thrust and radial shear – effect of temperature, Hinges with support at different levels.

Two Hinged Arches: Determination of horizontal thrust, bending moment, normal thrust and radial shear – Rib shortening and temperature stresses.

UNIT II

Moment Distribution Method: Introduction Stiffness and carry over factors – Distribution factors – Analysis of continuous beams with and without sinking of supports.

Kani's Method: Introduction – Rotational factor, Analysis of continuous beams – including settlement of supports.

UNIT III

Cable Structures and Suspension Bridges: Introduction, characteristics of cable, analysis of cables subjected to concentrated and uniformly distributed loads, anchor cable, temperature stresses, analysis of simple suspension bridge.

UNIT IV

Lateral Load Analysis on Frames: Approximate Methods, Portal Method and Cantilever Method, Computational techniques, algorithms.

UNIT V

Introduction to Matrix Methods: Flexibility methods: Introduction, application to continuous beams (maximum of two unknowns). Stiffness method: Introduction, application to continuous beams (maximum of two unknowns).

Text Books:

1. Structural Analysis, T. S. Thandavamoorthy, Oxford university press, India.

2. Structural Analysis, R.C. Hibbeler, Pearson Education, India

3. Theory of Structures – II, B. C. Punmia, Jain & Jain, Laxmi Publications, India.

4. Structural Analysis, C.S. Reddy, Tata Mc-Graw hill, New Delhi.

5. Structural Analysis - Vol. I and II,S.S.Bhavikatti,Vikas Publishing

House,New Delhi.

References:

- 1. Intermediate Structural Analysis, C. K. Wang, Tata McGraw Hill, India
- 2. Theory of structures, Ramamuratam, Dhanpatrai Publications.
- 3. Analysis of structures, Vazrani & Ratwani Khanna Publications.
- 4. Comprehensive Structural Analysis-Vol. I & 2, R. Vaidyanathan & P. Perumal- Laxmi Publications Pvt. Ltd., New Delhi
- 5. Structural Analysis I, P.N. Chandramouli. Yesdee Publishing Pvt Limited
- 6. Structural Analysis, Aslam Kassimali, Cengage Learning
- 7. Matrix Methods of Structural Analysis, P.N. Godbole, R. S. Sonaparote, PHI Learning Pvt Limited

Sem	V Sem	L	Т	Р	C	COURSE CODE	
Regulation	V20	3	0	0	3	V20CET10	
Name of the	CEOTECHNICAL ENCINEEDING						
Course	GEUTECHNICAL ENGINEERING						
Branch	CIVIL ENGINEERING						

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

- Develop the inter-relationships between various parameters of the soils (K3)
- Assess the permeability of soils having different properties (K3)
- Employ different methods to know the stress distribution in soils (K3)
- Interpret different parameters related to compaction and consolidation of soils (K3)
- Examine the stress strain behavior of soils under various drainage conditions(K3)

SYLLABUS

UNIT I

Soil Properties and Classification: Soil formation – soil structure and clay mineralogy – Adsorbed water – Mass- volume relationship –Relative density, Index Properties of Soils, Grain size analysis – Sieve and Hydrometer methods – consistency limits and indices – Various Types of soil Classifications – Unified soil classification and I.S. Soil classification.

UNIT II

Permeability: Soil water – capillary rise – One dimensioned flow of water through soils – Darcy's law- permeability – Factors affecting –laboratory determination of coefficient of permeability –Permeability of layered systems. Total, neutral and effective stresses – quick sand condition – 2-D flow and Laplace's equation – Seepage through soils – Flow nets: Characteristics and Uses.

UNIT III

Stress Distribution in Soils: Stresses induced by applied loads - Boussinesq's and Westergaard's theories for point loads and areas of different shapes–Newmark'sinfluence chart – 2:1 stress distribution method.

UNIT IV

Compaction: Mechanism of compaction – factors affecting – effects of compaction on soil properties - compaction control.

Consolidation: Compressibility of soils – e-p and e-log p curves – Stress history – Concept of consolidation - Spring Analogy - Terzaghi's theory of one-dimensional Consolidation – Time rate of consolidation and degree of consolidation – Determination of coefficient of consolidation (cv) - Over consolidated and normally consolidated clays.

UNIT V

Shear Strength of Soils: Basic mechanism of shear strength - Mohr – Coulomb Failure theories – Stress-Strain behavior of Sands - Critical Void Ratio – Stress-

Strain behavior of clays – Shear Strength determination- various drainage conditions.

Text Books:

1. "Basic and Applied Soil Mechanics", Gopal Ranjan and A. S. R. Rao, New Age International Publishers.

2. "Soil Mechanics and Foundation Engineering", V. N. S. Murthy, CBS publishers.

3. "Soil Mechanics and Foundations", B.C. Punmia, Laxmi Publications.

References:

1. "Fundamentals of Soil Mechanics", D. W. Taylor, Wiley.

2."An introduction to Geotechnical Engineering", Holtz and Kovacs; Prentice Hall.

3. "Fundamentals of Geotechnical Engineering", B M Das, Cengage Learning, New Delhi.

Sem	V Sem	L	Τ	Р	C	COURSE CODE	
Regulation	V20	3	0	0	3	V20CET11	
Name of the	DESIGN OF DE	INFOD	CED (ONCO	ETE	CTDUCTUDES	
Course	DESIGN OF RE	INFUR	LEDU	UNCR		SIRUCIURES	
Branch	CIVIL ENGINEERING						

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

- Design the beams in working stress and limit state methods (K5)
- Design the doubly reinforced and flanged (T and L) beam sections for flexure (K5)
- Design the continuous beams for shear and bond (K5)
- Design the one way, two way slabs and stair case of buildings (K5)
- Design the columns and footings of the structures (K5)

SYLLABUS

UNIT I

Introduction of Reinforced concrete: Structural elements- Loads on structures-Strength and serviceability - Methods of design - Working stress method- design constants - neutral axis - moment of resistance for different sections- Design of singly beams- Concepts of limit state design - Partial load and safety factors stress-strain curves for cold worked deformed bars and mild steel bars. Assumptions in limit state design – stress - block parameters – limiting moment of Resistance. Codes of practice.

UNIT II

Design for Flexure: Limit state analysis and design of singly reinforced sectionseffective depth- Moment of Resistance- Doubly reinforced and flanged (T and L) beam sections- Minimum depth for a given capacity- Limiting Percentage of Steel-Minimum Tension Reinforcement-Maximum Flexural Steel- Design of Flanged Sections (T&L)- Effective width of flange –Behavior- Analysis and Design.

UNIT III

Design for Shear and Bond and continuous beams: Limit state analysis and design of section for shear – concept of bond, anchorage and development length, I.S. code provisions.

Design examples in simply supported and continuous beams, detailing. Limit state design for serviceability: Deflection, cracking and code provision.

UNIT IV

Slabs: Classification of slabs, design of one - way slabs, one way continuous slab using IS Coefficients (Conventional) – Design of two - way slabs-simply supported and various edge conditions using IS Coefficients, Design of Stair Case.

UNIT V

Design of Compression members and footings: Effective length of a column, Design of short and long columns - under axial loads, uniaxial bending and biaxial bending – IS Code provisions.

Footings: Different types of footings - Design of isolated footings - square, rectangular.

NOTE:

All units i.e. from unit II to unit VI are to be taught in Limit State Design.

Following sheets should be prepared by the students.

Sheets-1 Reinforcement detailing of T-beams, L-beams and continuous beams.

Sheets-2 Reinforcement detailing of beam with all details.

Sheets-3 Detailing of one-way, two-way and continuous slabs.

Sheets-4 Reinforcement detailing of columns.

Sheets-5 Reinforcement detailing of isolated footings.

Examination Pattern:

Internal Examination Pattern:

The total internal marks are distributed in three components as follows: Descriptive (subjective type) examination : 15 marks Detailing sheets(For above) : 10 marks : 05 marks

Assignment

Text Books:

- "Limit State Design", A. K. Jain 1.
- 2. "Design of Reinforced concrete Structures", N. Subrahmanyian.
- 3. "Reinforced concrete", Vol.1., H. J. Shah, Charotar publishing house Pvt. Ltd.

References:

"R C C Design", B.C Punmia, A. K. Jain and A. K Jain. Lakshmi 1. **Publications**

"Reinforced Concrete Structures", N. Krishna Raju and R. N. Pranesh, New 2. Age

Publications.

3. "Reinforced Concrete Structures", S. Unnikrishna Pillai and Devdas Menon, Tata

Mc.Graw Hill, New Delhi.

- IS 456-2000, Code of practice for Reinforced Concrete Structures. 4.
- IS 875, Code of Practice for Design Loads. 5.
- SP-16, Design Aids for Reinforced Concrete. 6.

Sem	V Sem	L	Т	Р	С	COURSE CODE	
Regulation	V20	3	0	0	3	V20CET12	
Name of the	ADVANCED CONCRETE TECHNOLOGY (Professional						
Course	Elective -1)						
Branch	CIVIL ENGINEE	RING					

Upon successful completion of course the students will be able to

- Relate the material characteristics and their influence on concrete (K3)
- Predict concrete behavior based on its durability properties (K3)
- Illustrate mix proportioning of different types of concretes and their testing (K3)
- Select the suitable concrete based on their specific application (K3)
- Employ suitable concreting methods to place the concrete based on requirement (K3)

SYLLABUS

UNIT I

Ingredients of Concrete: Cement –chemical composition and their importance, hydration of cement, types of cement, testing of cement.

Fine aggregate: Functions, requirement, Alternatives to River sand, M-sand introduction and manufacturing.

Coarse aggregate: Importance of size, shape and texture. Grading and blending of aggregate, testing on aggregate, requirement, Recycled aggregates Water – qualities of water.

Chemical admixtures: Plasticizers, accelerators, retarders and air entraining agents.

Mineral admixtures: Pozzolanic and cementitious materials, Fly ash, GGBS, silica fumes, Metakaolin and rice husk ash, Green concrete.

UNIT II

Durability of Concrete: Durability, Transport mechanism of fluids and gases in concrete, cracking in concrete - corrosion and carbonation induced cracking, Alkali Aggregate Reaction, degradation by freeze and thaw, chloride attack, sulphate and sea water attack (marine conditions). Hot and cold weather concreting, water penetration and rapid curing tests.

UNIT III

Concrete Mix Design: Design of concrete mixes by IS code method - ACI method Design of high strength concrete mixes, design of fly-ash cement concrete mixes, design of high density concrete mixes.

Testing of Concrete: Test methods: Analysis of fresh concrete, Accelerated testing methods, Tests on hardened concrete, Core cutting and testing, partially destructive testing, Non-destructive testing of concrete structure

UNIT IV

Special Concrete: Lightweight concrete, autoclaved aerated concrete, no-fines concrete, lightweight aggregate concrete and foamed concrete, High strength concrete, refractory concrete, high density and radiation-shielding concrete, polymer concrete, fibre-reinforced concrete, mortars, renders, recycled concrete, Ferro Cement, Self Compacting Concrete.

UNIT V

Special processes and technology for particular types of structure: Sprayed concrete, underwater concrete, grouts, grouting and grouted concrete, mass concrete, slip form construction, pumped concrete, concrete for liquid retaining structures, vacuum process

Text Books:

- 1. Neville, A.M., Properties of Concrete, Pearson Education Asia (P) Ltd, England, 2000.
- 2. Concrete Technology, Gambhir M.L, Tata McGraw Hill
- 3. Concrete Technology, M.S.Shetty, S.Chand& Company New Delhi
- 4. Concrete microstructure, properties & materials, P.Kumar Mehata, Paulo & J.M. Monteiro,
- 5. Light Weight Concrete, Short & Kenniburg, Asia Publishing House, Bombay

References:

- 1. N. V. Nayak, A. K. Jain Handbook on Advanced Concrete Technology, ISBN: 978-81-8487-186-9
- 2. Job Thomas, "Concrete Technology", CENGAGE Learning, 2015.
- 3. IS 4926 (2003): Code of Practice Ready-Mixed Concrete [CED 2: Cement and Concrete] Criteria for RMC Production Control, Basic Level Certification for Production Control of Ready Mixed Concrete BMTPC.
- 4. Specification and Guidelines for Self-Compacting Concrete, EFNARC, Association House.

Sem	V Sem	L	Τ	Р	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CET13
Name of the	ΙΟΡΙΟΛΤΙΟΝ ΕΝ	ICINEE	DINC	(Drof		nal Elective 1)
Course	IKKIGATION EN	NGINEE	RING	(Pron	25510	lial Elective -1)
Branch	CIVIL ENGINEERING					

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

- Interpret the quality of irrigation water and water requirements (K2)
- Design the erodible and non-erodible canals using different theories (K5)
- Asses different irrigation canal structures (K3)
- Relate the diversion head works and their components (K3)
- Analyze the stability of Gravity and Earth dams (K3)

SYLLABUS

UNIT I

Irrigation & Water Requirements: Definition – Importance of Irrigation in India – Advantages and Dis advantages – Types of Irrigation – Quality of Irrigation water -Different types of crops and crop seasons- Soil, water and plant relationship-Irrigation efficiencies -Crop water requirement-Duty and Delta-Factors affecting duty-Depth and Frequency of Irrigation-crop rotation.

UNIT II

Canals: Classification-Alluvial and Non Alluvial canals-Design of non-erodible canals-Different command areas-Methods of economic section and maximum permissible velocity-Design of erodible canals-Kennedy's silt theory and Lacey's regime theory.

UNIT III

Canal structures: Falls-Types and location- Design principle of Sarda type wall and straight glacis wall

Regulators: Head and cross regulators –design principles

Cross Drainage works: Design principles of aqueduct- siphon aqueduct-super passage

UNIT IV

Diversion Head Works: Types of diversion head works-Weirs and Barrages-Layout of diversion head works-components- causes and failures of weirs on permeable foundations-Bligh's creep theory-Khosla's theory-exit gradient.

UNIT V

Reservoir planning: Site selection-Types of dams- selection of type of damselection of site for a dam.

Gravity Dams: Forces acting on gravity dam-causes of failure of gravity damelementary profile and practical profile of gravity dam-limiting height of damstability analysis-drainage galleries. **Earthen Dams:** Types of earthen dams-causes of failure-criteria for safe design-seepage-measures of control of seepage filters.

Text Books:

- 1. Irrigation Engineering and Hydraulic structures, Santosh Kumar Garg, Khanna Publishers.
- 2. Irrigation and Water power Engineering, B.C. Punmia, Pande B.B. Lal, Ashok Kumar Jain, Arun Kumar Jain, Lakshmi Publications Ltd.
- 3. Water resources and Irrigation engineering by Sri Krishna publications.

References:

- 1. Irrigation and Water Resources Engineering, Asawa G L (2013), New Age International Publishers.
- 2. Irrigation Water Resources and Water Power Engineering, Modi P N (2011), Standard book House, New Delhi.
- 3. Irrigation and Drainage Engineering" by Peter Waller and Muluneh Yitayew

Sem	V Sem	L	Т	Р	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CET14
Name of the Course	TRAFFIC ENGINEERING AND MANAGEMENT (Professional Elective -I)					
Branch	CIVIL ENGINEE	RING				

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

- Understand basics principles of Traffic Engineering (K2)
- Analyze parking data and model accidents (K3)
- Determine traffic capacity and level of service (K3)
- Design of Signalized systems and Rotary Intersections (K5)
- Employ engineering techniques to achieve safe and efficient movement of people

and goods on roadways (K3)

SYLLABUS

UNIT I

Traffic Studies (Part- I) : Basic principles of Traffic, Volume, Speed and Density; Definitions and their interrelationships; Traffic Volume studies - Objectives, Methods of Volume counts, Presentation of Volume Data; Speed studies- Types of Speeds, Objectives, Methods of speed studies, Presentation of speed data. Delay Studies; Head ways and Gap Studies - Headway and Gap acceptance, Origin and Destination Studies.

UNIT II

Traffic Studies (Part-II) : Parking Studies: parameters of parking, definitions, Parking

inventory study, Parking survey by Patrolling method; Analysis of Parking Survey data; Parking Management Accident studies - Causative factors of Road accidents, Accident data collection: Road Safety Auditing, Measures to increase Road safety. Pedestrian studies, Bicycle path studies, sky walk planning.

UNIT III

Capacity and LOS Analysis: Introduction to Traffic capacity, Analysis concepts, Level of Service, Basic definitions, Factors affecting Capacity and LOS as per Indo-HCM,Capacity of Urban/Rural Highway, With or without access control, Basic freeway segments-Service flow rate of LOS, Lane width or Lateral clearance adjustment; Heavy vehicle adjustment; Driver population adjustment.

UNIT IV

Design of Signal and Intersections: Fixed Time signals, Determination of Optimum Cycle length and Signalsetting for Fixed Time signals, Flexible progressive system, Warrants for Signals, Signal Coordination.

Rotary planning , Rotary Design as per IRC:65, Weaving angles, Entry width, Exit Radius, Capacity of Rotary, Types of interchanges, Implementation.

UNIT V

Transportation System Management: Measures for Improving vehicular flow – one way Streets, Signal Improvement, Transit Stop Relocation, Reversible lanes - Reducing Peak Period Traffic - Strategies for working hours, Congestion Pricing, Differential Toll Policies.

Text Books:

1. Traffic Engineering and Transportation Planning – L.R. Kadiyali, Khanna Publishers

2. Principles of Highways Engineering and Traffic Analysis - Fred Mannering & Walter

Kilareski, John Wiley & Sons Publication.

3. Transportation Engineering - An Introduction - C. Jotin Khisty, Prentice Hall Publication.

References:

1. Fundamentals of Transportation Engineering - C. S. Papacostas, Prentice Hall India.

- 2. Traffic Engineering Theory & Practice Louis J. Pignataro, Prentice Hall Publication.
- 3. Traffic Engineering by Roger P. Roess, William R. Mc. Shane, Elena S. Prassas ,

Prentice Hall, 1977.

4. IRC-65-2017: Guidelines for Planning and Design of Roundabouts (First Revision)

5. IRC-93-1985: Guidelines for design and installation of road traffic signals 6. Indian Highway capacity manual (Indo-HCM) – 2017, Published by CSIR-CRRI, New Delhi.

Sem	V Sem	L	Т	Р	C	COURSE CODE		
Regulation	V20	3	0	0	3	V20CET15		
Name of the	AIR POLLUTION AND CONTROL							
Course	(Professional Ele	(Professional Elective –I)						
Branch	CIVIL ENGINEERING							

Upon successful completion of this course, the students will be able to:

- Asses the pollutants and ambient quality of air (K3)
- Illustrate the plume behavior in a prevailing environmental condition (K3)
- Examine carbon credits for various day to day activities(K3)
- Select proper technique to control the air particulates (K3
- Choose appropriate in plant control measures for different emissions (K3)

SYLLABUS:

UNIT I

Air Pollution: Sampling and analysis of air pollutants, conversion of ppm into $\mu g/m3$. Definition of terms related to air pollution and control - secondary pollutants – Indoor air pollution – Ozone holes and Climate Change and its impact - Carbon Trade.

UNIT II

Meteorology and Air Pollution: Properties of atmosphere: Heat, Pressure, Wind forces, Moisture and relative Humidity, Lapse Rates - Influence of Terrain and Meteorological phenomena on plume behaviour and Air Quality - Wind rose diagrams and Isopleths Plume Rise Models

UNIT III

Ambient Air Quality Management: Monitoring of SPM - RPM SO2; NOx and CO - Stack Monitoring for flue gases - Micro-meteorological monitoring – Noise Monitoring - Weather Station. Emission Standards- Gaussian Model for Plume Dispersion

UNIT IV

Air Pollution Control: Control of particulates – Control at Sources, Process Changes, Equipment modifications, Design and operation of control Equipments – Settling Chambers, Cyclone separators –Fabric filters–Scrubbers, Electrostatic precipitators

UNIT V

Air Pollution Control Methods: Control of NOx and SOx emissions – Environmental friendly fuels - In-plant Control Measures, process changes, methods of removal and recycling. Environmental criteria for setting industries and green belts.

Text Books:

1. Air Pollution and Control, K.V.S.G. Murali Krishna, Laxmi Publications, New Delhi,

2015

2. Air Pollution, M. N. Rao and H. V. N. Rao, Tata McGraw Hill Company.

3. Environmental Science and Engineering by J.G. Henry and G.W. Heinke – Pearson

Education.

References:

1. An Introduction to Air pollution, R. K. Trivedy and P.K. Goel, B.S. Publications.

2. Air Pollution by Wark and Warner - Harper & Row, New York.

Sem	V Sem	L	Т	Р	С	COURSE CODE	
Regulation	V20	3	0	0	3	V20CET16	
Name of the	GEO-ENVIRONMENTAL ENGINEERING (Professional						
Course	Elective –I)						
Branch	CIVIL ENGINEE	RING					

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

- Identify the Geo-environmental pollutants and their governing factors (K2)
- Employ the techniques for safe disposal of waste (K3)
- Relate the sub surface contamination transport (K3)
- Practice the utilization of solid waste for soil stabilization (K3)
- Select different remediation techniques to improve contaminated soil (K3)

SYLLABUS

UNIT I

Introduction to Geo Environmental Engineering: Environmental cycle – Sources, production and classification of waste – Causes of soil pollution – Factors governing soil pollution interaction clay minerals - Failures of foundation due to waste movement.

UNIT II

Safe Disposal of Waste: Site selection for landfills – Characterization of land fill sites and waste – Risk assessment – Stability of landfills – Current practice of waste disposal – Monitoring facilities – Passive containment system – Application of geosynthetics in solid waste management – Rigid or flexible liners.

UNIT III

Transport Of Contaminants : Contaminant transport in sub surface - Advection, Diffusion, Dispersion – Governing equations – Contaminant transformation – Sorption – Biodegradation – Ion exchange – Precipitation – Hydrological consideration in land fill design – Ground water pollution.

UNIT IV

Stabilization: Solidification of wastes – Micro and macro encapsulation – Absorption, Adsorption, Precipitation – Detoxification – Mechanism of stabilization – Organic and inorganic stabilization – Utilization of solid waste for soil improvement – case studies.

UNIT V

Remediation of Contaminated Soils: Exsitu and Insitu remediation-Solidification, bio-remediation, incineration, soil washing, phyto remediation, soil heating, vetrification, bio-venting.

Text Books:

 Hari D. Sharma and Krishna R. Reddy, "Geo-Environmental Engineering" – John Wiley and

Sons, INC, USA, 2004.

2. Daniel B.E., "Geotechnical Practice for waste disposal", Chapman & Hall, London 1993.

3. Manoj Datta," Waste Disposal in Engineered landfills", Narosa Publishing House, 1997.

4. Manoj Datta, B.P. Parida, B.K. Guha, "Industrial Solid Waste Management and Landfilling

Practice", Narosa Publishing House, 1999.

References

1. Westlake, K, "Landfill Waste pollution and Control", Albion Publishing Ltd., England, 1995.

2. Wentz, C.A., "Hazardous Waste Management", McGraw Hill, Singapore, 1989

3. Proceedings of the International symposium on "Environmental

Geotechnology" (Vol.I and II).

Environmental Publishing Company, 1986 and 1989.

4. Ott, W.R., "Environmental indices, Theory and Practice", Ann Arbor, 1978.

5. Fried, J.J., "Ground Water Pollution", Elsevier, 1975.

6. ASTM Special Tech. Publication 874, Hydraulic Barrier in Soil and Rock, 1985.

7. Lagrega, M.D., Buckinham, P.L. and Evans, J.C., "Hazardous Waste Management" McGraw

Hill Inc. Singapore, 1994.

Sem	V Sem	L	Т	Р	C	COURSE CODE	
Regulation	V20	0	0	3	1.5	V20CEL07	
Name of the	CEOTECHNICAL ENCINEEDING LAD						
Course	GEOTECHNICAL ENGINEERING LAB						
Branch	CIVIL ENGINEERING						

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

- Employ index properties required for classification of soils (K3)
- Find the permeability of different soils using different tests (K3)
- Predict the compaction, consolidation and swelling characteristics of the soils (K3)
- Compute the strength properties of soils (K3)

List of Experiments

- 1. Specific gravity, G
- 2. Atterberg's Limits.
- 3. Field density-Core cutter and Sand replacement methods
- 4. Grain size analysis by sieving
- 5. Hydrometer Analysis Test
- 6. Permeability of soil Constant and Variable head tests
- 7. Compaction test
- 8. Consolidation test (to be demonstrated)
- 9. Direct Shear test
- 10.Triaxial Compression test (UU Test)
- **11.Unconfined Compression test**
- 12.Vane Shear test
- 13.Differential free swell (DFS)
- 14.CBR Test

List Of Equipments

- 1. Casagrande's liquid limit apparatus.
- 2. Apparatus for plastic and shrinkage limits
- 3. Field density apparatus for
 - a) Core cutter method
 - b) Sand replacement method

4. Set of sieves: 4.75 mm, 2 mm, 1 mm, 0.6 mm, 0.42 mm, 0.3 mm, 0.15 mm, and

- 0.075 mm.
- 5. Hydrometer
- 6. Permeability apparatus for
- a) Constant head test
- b) Variable head test
- 7. Universal auto compactor for I.S light and heavy compaction tests.
- 8. Shaking table, funnel for sand raining technique.
- 9. Apparatus for CBR test

10. 10 tons loading frame with proving rings of 0.5 tons and 5 tons capacity

11.One dimensional consolation test apparatus with all accessories.

12. Triaxial cell with provision for accommodating 38 mm dia specimens.

13. Box shear test apparatus

14. Laboratory vane shear apparatus.

15. Hot air ovens (range of temperature 500 - 1500C

References:

1. Determination of Soil Properties, J. E. Bowles.

2. IS:2720 – Relevant Parts of Bureau of Indian Standards, New Delhi.

Sem	V Sem	L	Τ	Р	C	COURSE CODE
Regulation Year	V203	0	0	3	1.5	V20CEL08
Name of the	CTDUCTUDAL I		INC I	ICINC	A I I T	
Course	SIRUCIURALI	JETAIL	and	Jaing	AUT	J CAD
Branch	CIVIL ENGINEERING					

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

- Employ detailing of different building components (K3)
- Employ detailing of retaining walls (K3)
- Employ detailing of water tanks (K3)
- Employ detailing of septic tank (K3)

AutoCAD (2 Drafting)

- 1. Detailing of slab (One way & two way slabs)
- 2. Detailing of stair case (dog legged stair case)
- 3. Detailing of foundation (isolated, combined foundation)
- 4. Detailing of beams and columns in frame
- 5. Detailing of retaining wall (gravity)
- 6. Detailing of column base
- 7. Detailing of roof truss (king and queen post)
- 8. Detailing of box culvert
- 9. Detailing of water tank
- 10.Detailing of septic tank

<u>VI SEMESTER – SYLLABUS</u>

Sem	VI Sem	L	Т	Р	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CET17
Name of the Course	DESIGN OF STEEL STRUCURES					
Branch	CIVIL ENGINEERING					

Course Outcomes:

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

- Design the riveted, bolted and welded connection (K5)
- Design the beams against deflection, shear, buckling, and bearing (K5)
- Design of tension, compression and roof trusses for different loading conditions (K5)
- Design the compression members and column foundations (K5)
- Design the plate girder and gantry girder (K5)

SYLLABUS

UNIT I

Connections: Introduction - Properties of structural steel - IS Rolled sections - I.S Specifications - Lap and Butt connections (Revited and Bolted connections) - Eccentric connections.

Welded connections: Introduction - Advantages and disadvantages of welding-Strength of welds - Butt and fillet welds - Permissible stresses - IS Code requirements - Design of Butt and fillet weld subjected to moment acting in the plane and at right angles to the plane of the joints.

UNIT II

Beams: Allowable stresses - Design requirements as per IS Code-Design of simple and compound beams - Curtailment of flange plates - Beam to beam connection check for deflection, shear, buckling, and bearing - Design of laterally unsupported beams.

UNIT III

Tension Members: Introduction to different modes of failures - gross section yielding - Net Section rupture and block shear failure - Determine the design strength due to yielding of gross section - rupture of critical section and block shear - Design of tension members.

Compression Members: Effective length of columns - Slenderness ratio - permissible stresses - Design of compression members, Design of Struts.

Roof Trusses: Different types of trusses – Design loads – Load combinations as per IS Code recommendations, structural details –Design of simple roof trusses involving the design of purlins, members and joints.

UNIT IV

Built up compression members: Design of lacings and battens. Design Splicing of columns.

Design of Column Foundations: Introduction - Design of slab base - Design of gusset base- Column bases subjected to moment.

UNIT V

Design of Plate Girder: Introduction - Design consideration - IS Code recommendations - Design of plate girder - Welded -curtailment of flange plates and stiffeners - splicing and connections.

Design of Gantry Girder: Introduction - Impact factors - longitudinal forces-Design of Gantry girders.

NOTE:

All units i.e. from unit II to unit-VI to be taught in Limit State method only.

Welding Connections should be used from Unit II – Unit V.

The students should prepare the following sheets.

Sheets-1 Detailing of steel members Connection.

Sheets-2 Detailing of beams including curtailment of flange plates.

Sheets-3 Detailing of Column including lacing and battens.

Sheets-4 Detailing of Column bases, slab base and gusseted base.

Sheets-5 Detailing of Plate girder including curtailment, splicing and stiffeners.

EXAMINATION PATTERN:

Internal Examination Pattern:

The total internal marks are distributed in three components as follows:

Descriptive (subjective type)	examination : 15 marks
Detailing sheets(For above)	: 10 marks
Assignment	: 05 marks

Text Books:

1. Design of steel structures, S.K. Duggal, Tata McGraw Hill, and New Delhi.

2. Design of steel structures, S.S.Bavakatti, I.K.International Publishing House Pvt. Ltd.

3. Steel Structures Design and Practice, N.Subramanian, Oxford University Press.

4. Design of Steel Structures, Ramachandra, Scientific Publishers Journals Dept.

References:

1. Structural Design in Steel, Sarwar Alam Raz, New Age International Publishers, New

Delhi.

- 2. Design of Steel Structures, P. Dayaratnam, S. Chand Publishers.
- 3. Design of Steel Structures, M.Raghupathi, Tata Mc. Graw-Hill.
- 4. Structural Design and Drawing, N. Krishna Raju, University Press.
- 5. IS: 800- 2007, General construction in steel-Code of practice.
- 6. IS: 875-1987, Code of Practice for Design Loads.
- 7. Steel Tables

Sem	VI Sem	L	Т	Р	C	COURSE CODE			
Regulation	V20	3	0	0	3	V20CET18			
Name of the Course	FOUNDATION ENGINEERING								
Branch	CIVIL ENGINEERING								

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

- Employ the soil exploration and carryout the field testing (K3)
- Examine the slope stability and earth pressures using different theories (K3)
- Determine the bearing capacity of shallow foundations using bearing capacity criteria (K4)
- Determine the bearing capacity of shallow foundations using settlement criteria (K4)
- Design the deep foundations for different loading and soil conditions (K5)

SYLLABUS

UNIT I

Soil Exploration: Need, Methods of soil exploration – Boring and Sampling methods, Field tests, Penetration Tests, Pressure meter, planning of programme and preparation of soil investigation report.

UNIT II

Slope Stability: Infinite and finite earth slopes in sand and clay, types of failures, factor of safety of infinite slopes, stability analysis by Swedish arc method, standard method of slices ,Taylor's Stability Number, Stability of slopes of dams and embankments – different conditions.

Earth-Pressure theories: Rankine's& Coulomb's theory of earth pressure, Culmann's graphical method, earth pressures in layered soils.

UNIT III

Shallow Foundations – Bearing Capacity Criteria: Types of foundations and factors to be considered in their location , Bearing capacity – criteria for determination of bearing capacity – factors influencing bearing capacity, analytical methods to determine bearing capacity – Terzaghi's theory ,IS Methods.

UNIT IV

Shallow Foundations – Settlement Criteria: Safe bearing pressure based on N-value, allowable bearing pressure; safe bearing capacity and settlement from plate load test – Types of foundation settlements and their determination - allowable settlements of structures.

UNIT V

Deep Foundations: Pile foundation, Types of piles, Load carrying capacity of piles based on static pile formulae, Dynamic pile formulae, Pile load tests, Load carrying capacity of pile groups in sands and clays.

Well Foundations: Types, Different shapes of well, Components of wellfunctions, forces acting on well foundations, Design Criteria –Determination of staining thickness and plug - construction and Sinking of wells, Tilt and shift. **Text Books:**

- 1. Principles of Foundation Engineering, Das, B.M., (2011), 6th edition Cengage learning.
- 2. Basic and Applied Soil Mechanics, Gopal Ranjan& A.S.R. Rao, New Age International Pvt. Ltd, (2004).
- 3. Soil Mechanics and Foundations, B.C.Punmia, Laxmi Publictions.

References:

- 1. Foundation Analysis and Design, Bowles, J.E., McGraw-Hill Publishing Company, Newyork.
- 2. Theory and Practice of Foundation Design, N.N.SOM & S.C.DAS PHI Learning Private limited.

Sem	VI Sem	L	Т	Р	С	COURSE CODE		
Regulation	V20	3	0	0	3	V20CET19		
Name of the								
Course	ENVIKUNMENTAL ENGINEERING							
Branch	CIVIL ENGINEERING							

Upon successful completion of this course, the students will be able to:

- Clarify the protected water supply systems and their importance (K2)
- Assess different sources of water and proper intake structures (K3)
- Select suitable primary treatment process based on the quality of raw water (K3)
- Select suitable secondary treatment process (K3)
- Employ proper distribution system (K3)

UNIT I

Protected Water Supply systems: Importance and Necessity, Water borne diseases, Flow chart of public water supply system, Role of Environmental Engineer, Agency activities. Water Demand and Quantity Estimation: Estimation of water demand for a town or city, Per capita Demand and factors influencing it - Types of water demands and its variations- factors affecting water demand, Design Period, Factors affecting the Design period, Population Forecasting

UNIT II

Sources of Water: Lakes, Rivers, Impounding Reservoirs, comparison of sources with reference to quality, quantity and other considerations- Capacity of storage reservoirs, Mass curve analysis. Groundwater sources of water: Types of water bearing formations, springs, Wells and Infiltration galleries, Yields from infiltration galleries. Collection and Conveyance of Water: Factors governing the selection of the intake structure, Types of Intakes. Conveyance of Water: Gravity and Pressure conduits.

UNIT III

Quality Analysis and Primary Treatment of Water: Characteristics of water– Physical, Chemical and Biological- Analysis of Water – Physical, Chemical and Biological characteristics.

Flowchart of water treatment plant, Primary Treatment methods - Theory and Design of Sedimentation, Coagulation, Sedimentation with Coagulation

UNIT IV

Secondary Treatment of Water: Filtration – types of filters – Design and working principles; Theory of disinfection-Chlorination and other Disinfection methods, Softening of Water, Removal of color and odours - Iron and Manganese removal –
Adsorption-fluoridation and deflouridation–aeration– Reverse Osmosis-Iron exchange–Ultra filtration.

UNIT V

Distribution of Water: Requirements- Methods of Distribution system, Layouts of Distribution networks, Pressures in the distribution layouts, Analysis of Distribution networks: Hardy Cross and equivalent pipe methods -Components of Distribution system: valves such as sluice valves, air valves, scour valves and check valves, hydrants, water meters and Pipes –Laying and testing of pipe lines-selection of pipe materials, pipe joints.

Text Books:

1. Elements of Environmental Engineering by K.N. Duggal, S. Chand Company Ltd., New Delhi, 2012.

2. Water Supply Engineering by Dr. P.N. Modi, Standard book house, 4th edition (2015)

3. Water Supply Engineering by B.C. Punmia, Laxmi publications, volume-I

4. Water supply and sanitary engineering by S. C. Rangwala, Charotar publishing house, 29th edition (2016)

References:

1. Water supply engineering by S. K. Garg , Khanna publishers, ,33rd edition (2010)

2. Environmental Engineering by Howard S. Peavy, Donald R. Rowe (2017) Mc-Graw-Hill Book Company, New Delhi, 1985.

3. IS 10500:2012, Drinking water specification.

4. IS: 3052 (Part-08), Methods of sampling and Test (physical and chemical) for water and wastewater.

Sem	VI Sem	L	Т	Р	С	COURSE CODE
Regulation	V20	3	0	0	3	V20CET20
Name of the Course	BRIDGE ENGIN	EERING	G (Pro	fessio	nal E	lective - II)
Branch	CIVIL ENGINEE	RING				

Upon successful completion the course the student will be able to

- Generalize different types of bridges, loading standards and end conditions (K2)
- Assess different reactions and moments in the T beam bridge (K3)
- Design of pier and abutment caps of bridges (K5)
- Design of well foundation with different parameters of sub soil (K5)
- Outline the effectiveness of different bearings of a bridge (K4)

UNIT I

Introduction: Bridges- Types- Slab bridges, T Beam, Arch bridges, Cable Stayed bridges, prestressed concrete bridges, Truss Bridges, Culverts, - Nomenclature-Selection of Bridge Site- Economical span- Abutments pier and end connections-types of foundations- Open, Pile, Well Foundations, Bearings – Types- Introduction to Loading standards- Railway and IRC Loading

UNIT II

T-Beam Bridge: Pigeaud's method for computation of slab moments; Courbon's method for computation of moments in girders; Design of simply supported T-beam bridge.

UNIT III

Sub Structure for Bridges: Pier and abutment caps; Materials for piers and abutments, Design of pier; Design of abutment; Backfill behind abutment; approach slab.

UNIT IV

Foundations for Bridges: scour at abutments and piers; Grip length; Types of foundations; Design of well foundation.

Box Culverts: Loading – Analysis and Design- Reinforcement detailing

UNIT V

Bearings for Bridges: Importance of bearings; bearings for slab bridge; bearings for girder bridges; Expansion bearings; Fixed bearings; Design of elastomeric pad bearing.

Text Books:

- 1. Essentials of Bridge Engineering by Dr. Johnson Victor; Oxford & IBH publishing Co. Pvt.Ltd
- 2. Cable supported bridges, concepts and design by N J Gimsing. John Willey and Sons

3. Design of Bridges, N. Krishna Raju, Tata McGraw Hill

- 1. Design of Bridge Structures by T. R Jagadeesh, M.A Jayaram, Prentice Hall of India Pvt. Ltd.
- 2. Design of Concrete Bridges, Aswini, Vazirani, Ratwani
- 3. Bridge Engineering by S.Ponnuswamy

Sem	VII Sem	L	Т	Р	С	COURSE CODE	
Regulation	V20	3	0	0	3	V20CET21	
Name of the Course	EARTH RETAINING STRUCTURES (Professional Elective – II)						
Branch	CIVIL ENGINEER	ING					

Upon successful completion of this course, the students will be able to

- Compute the lateral earth pressures associated with different earth systems (K3)
- Assess the failure criterion and stability requirements of retaining wall (K3)
- Analyze the sheet pile structure for both external and internal stability (K4)
- Apply the knowledge of reinforced earth in designing earth retaining systems (K3)
- Relate different methods for the stability of braced cuts and cofferdams (K3)

SYLLABUS

UNIT I

Earth pressures: Different types and their coefficients; Classical Theories of Earth pressure – Rankine's and Coulomb's Theories for Active and Passive earth pressure; Computation of Lateral Earth Pressure in Homogeneous and Layered soils; Graphical solutions for Coulomb's Theory in active and passive conditions.

UNIT II

Retaining walls: Types, Type of Failures of Retaining Walls – Stability requirements –Drainage behind Retaining walls – Provision of Joints – Relief Shells.

UNIT III

Sheet Pile Structures: Types of Sheet piles – Cantilever sheet piles in sands and clays – Anchored sheet piles – Free earth and Fixed earth support methods – Rowe's moment reduction method – Location of anchors and Design of Anchorage system.

UNIT IV

Soil reinforcement: Reinforced earth - Different components – their functions – Design principles of reinforced earth retaining walls.

UNIT V

Braced cuts and Cofferdams: Lateral Pressure in Braced cuts – Design of Various Components of a Braced cut – Stability of Braced cuts – Bottom Heave in cuts. – Types of cofferdam, suitability, merits and demerits – Design of single – wall cofferdams and their stability aspects – TVA method and Cummins' methods.

Text Books:

- 1. Principles of Foundation Engineering by Braja M Das, Cengage Learning
- 2. Foundation analysis and design by Bowles, J.E., McGraw Hill
- 3. Soil Mechanics in Engineering Practice Terzaghi, K and Ralph B. Peck, John Wile & Sons.

- 1. Earth Pressure and Earth Retaining Structures by Chris RI Clayton, Rick I woods, Andrew J Bond and Jarbas Milititsky, CRC Press, Taylor and Francis Group, New York.
- 2. Analysis and Design of Foundations and Retaining Structures, Samsher Prakash
- 3. Gopal Ranjan and Swami Saran, Saritha Prakashan Publishers, New Delhi.
- 4. NPTEL course materials on Geo-synthetics and Earth Retaining Structures

Sem		VI Sem	L	Τ	Р	С	COURSE CODE	
Regulation		V20	3	0	0	3	V20CET22	
Name of	the	URBAN HYDROLOGY & HYDRAULICS						
Course		(Professional Ele	(Professional Elective – II)					
Branch		CIVIL ENGINEE	RING					

Upon successful completion of this course, the students will be able to

- Develop the drainage systems corresponding to the trends in urbanization (K3)
- Assess the urban drainage flow pattern (K3)
- Select suitable elements of drainage system (K3)
- Relate the detention and retention facilities of storm water (K3)
- Prepare typical drainage master plan for an urbanized area (K3)

SYLLABUS

UNIT I

Introduction: Urbanization and its effect on water cycle – urban hydrologic cycle – Trends in urbanization – Effect of urbanization on hydrology

Precipitation Analysis: Importance of short duration of rainfall and runoff data, methods of estimation of time of concentration for design of urban drainage systems, design storms for urban drainage systems.

UNIT II

Approaches to urban drainage: Time of concentration, peak flow estimation approaches, rational method, NRCS curve number approach, runoff quantity and quality, wastewater and storm water reuse, major and minor systems.

UNIT III

Elements of drainage systems: Open channel, underground drains, appurtenances, pumping, source control.

UNIT IV

Analysis and Management: Storm water drainage structures, design of storm water network- Best Management Practices–detention and retention facilities, swales, constructed wetlands, models available for storm water management.

UNIT V

Master drainage plans: Issues to be concentrated upon – typical urban drainage master plan, interrelation between water resources investigation and urban planning processes, planning objectives, comprehensive planning, use of models in planning.

Text Books:

1. Manual on Drainage in Urbanised area, Geiger W. F., J Marsalek, W. J. Rawls and F.C. Zuidema, (1987 - 2 volumes), UNESCO,

- 2. Urban Hydrology, Hall M J (1984), Elsevier Applied Science Publisher.
- 3. Hydrology Quantity and Quality Analysis, Wanielista M P and Eaglin (1997), Wiley and Sons

4. Urban Hydrology, Hydraulics and Storm water Quality: Engineering Applications and Computer Modelling, Akan A.O and R.L. Houghtalen (2006), Wiley International.

References:

1. Storm water Detention for Drainage, Stahre P and Urbonas B (1990), Water Quality and CSO Management, Prentice Hall.

2. Urban water cycle processes and interactions, Marsalek et. al. (2006), Publication No. 78, UNESCO, Paris(<u>http://www.bvsde.paho.org/bvsacd/</u>cd63/149460E.pdf)

3. Frontiers in Urban Water Management – Deadlock or Hope, by Maksimovic C and J A Tejada-Guibert (2001), IWA Publishing

Sem	VI Sem	L	Т	Р	С	COURSE CODE	
Regulation	V20	3	0	0	3	V20CET23	
Name of the	PAVEMENT ANALYSIS AND DESIGN						
Course	(Professional Ele	(Professional Elective – II)					
Branch	CIVIL ENGINEERING						

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

- Employ different factors influencing the flexible pavement design (K3)
- Employ different factors influencing the rigid pavement design (K3)
- Analyze stresses and strains in flexible and rigid pavement using different theories (K3)
- Design a flexible pavement using Asphalt Institute, and AASHTO methods (K5)
- Design a rigid pavement using AASHTO methods (K5)

SYLLABUS

UNIT I

Factors Affecting Flexible Pavement Design: Variables Considered in Pavement Design, Types of Pavements, Functions of Individual Layers, EAL and ESWL Concepts, Traffic Analysis: ADT, AADT, Truck Factor, Growth Factor, Lane Distributions & Vehicle Damage Factors, Effect of Transient & Moving Loads.

UNIT II

Factors Affecting Rigid Pavement Design: Rigid pavement layers, Classification of Axle Types of Rigid Chassis and Articulated Commercial Vehicles, Legal Axle and Gross Weights on Single and Multiple Units, Tire Pressure, Contact Pressure,

UNIT III

Stresses in Flexible and Rigid Pavement: Visco-Elastic Theory and Assumptions, Layered Systems Concepts, Stress Solutions for One, Two and Three Layered Systems, Fundamental Design Concepts, Westergaard's Theory and Assumptions, Stresses due to Curling, Stresses and Deflections due to Loading, Frictional Stresses, and Stresses in Dowel Bars & Tie Bars

UNIT IV

Design of Flexible Pavements: Factors effecting Design. Deflection studies in Flexible Pavements. Present Serviceability Index, Pavement Performance and methods- AASHTO and Asphalt Institute Method.

UNIT V

Design of Rigid Pavements: Factors effecting Design – Wheel load & its repetition, subgrade strength & proportion, strength of concrete- modulus of elasticity, Reinforcement in slab, Design of joints. Design of Dowel bars, Design of Tie bars. AASHTO methods of Rigid Pavement design.

Text Books:

1. Principles of Pavement Design, Yoder.J. &Witzorac Mathew, W. John Wiley & Sons Inc

2. Pavement Analysis & Design, Yang H. Huang, Prentice Hall Inc.

3. AASHTO Pavement Design Guide (1993)

- 1. Design of Functional Pavements, Nai C. Yang, McGraw Hill Publications
- 2. Concrete Pavements, AF Stock, Elsevier, Applied Science Publishers.
- 3. Pavement and Surfacing for Highway & Airports, Micheal Sargious, Applied Science Publishers Limited.
- 4. IRC: 37 & 58 Codes for Flexible and Rigid Pavements Design.

Sem	VI Sem	L	Т	Р	C	COURSE CODE	
Regulation	V20	3	0	0	3	V20CET24	
Name of the Course	REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEM (Professional Elective – II)						
Branch	CIVIL ENGINEE	RING					

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

- Generalize the basic principles of Remote Sensing and GIS, including ground, air and satellitebased sensor platforms (K2)
- Interpret the aerial photographs and satellite imageries (K2)
- Relate the process of data entry and preparation (K3)
- Examine the Spatial Data for a variety of applications (K3)
- Employ RS and GIS for diverse applications (K3)

SYLLABUS

UNIT I

Introduction to Remote Sensing: Basic concepts of remote sensing, electromagnetic radiation, electromagnetic spectrum, interaction with atmosphere, energy interaction with the earth surfaces, Characteristics of remote sensing systems.

Sensors and platforms: Introduction, types of sensors, airborne remote sensing, space borne remote sensing, image data characteristics, digital image data formats-band interleaved by pixel, band interleaved by line, band sequential, IRS, LANDSAT, SPOT, MODIS, ASTER, RISAT and CARTOSAT.

UNIT II

Image analysis: Introduction, elements of visual interpretations, digital image processing- image preprocessing, image enhancement, image classification, supervised classification, unsupervised classification.

UNIT III

Geographic Information System: Introduction, key components, application areas of GIS, map projections.

Data entry and preparation: spatial data input, raster data models, vector data models.

UNIT IV

Spatial data analysis: Introduction, overlay function-vector overlay operations, raster overlay operations, arithmetic operators, comparison and logical operators, conditional expressions, overlay using a decision table, network analysis-optimal path finding, network allocation, network tracing and buffer analysis.

UNIT V

RS and GIS Applications: Land cover and land use, agriculture, forestry, geology, geomorphology, urban applications.

Applications of Hydrology, Water Resources and Disaster Management: Food zoning and mapping, groundwater prospects and potential recharge zones, watershed management and disaster management with case studies.

Text Books:

- 1. "Remote sensing and GIS", Bhatta, B., Oxford University Press, 2008.
- 2. "Remote Sensing and Geographical Information Systems", Anji Reddy, M., B S Publications, 2008.
- 3. "Basics of Remote Sensing and GIS" Kumar. S., Laxmi Publications,

- 1. "Fundamentals of Remote Sensing", George Joseph, Universities Press, 2013.
- 2. "Concepts and Techniques of Geographical Information System", Chor Pang Lo and Yeung, A.K.W., Prentice Hall, India, 2006.
- 3. "Remote Sensing and its Applications", Narayan L.R.A, Universities Press, 2012.
- 4. "Introduction to Geographic Information Systems", Kand Tsung Chang, McGraw Hill Higher Education, 2009.
- 5. "Basics of Remote sensing & GIS", Kumar, S., Laxmi Publications, New Delhi, 2005.
- 6. "Principals of Geographical Information Systems", Burrough, P.A and McDonnell, R.A. Oxford University Press, 1998.
- 7. "Remote Sensing", Schowenger, R. A., Elsevier publishers, 2006.
- 8. "Remote Sensing and Image Interpretation", Lillesand, T.M, Kiefer, R.W. and Chipman, J.W., Wiley India Pvt. Ltd., New Delhi, 2013.
- 9. "Fundamentals of Geographic Information Systems", Demers, M.N, Wiley India Pvt. Ltd, 2013

Sem	VI Sem	L	Т	Р	C	COURSE CODE	
Regulation	V20	0	0	3	1.5	V20CEL09	
Name of the Course	ENVIRONMENTAL ENGINEERING LAB						
Branch	CIVIL ENGINEERING						

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

- Illustrate the characteristics of water and waste water (K3)
- Predict the portability of water (K3)
- Examine the condition of water based on the tested parameters (K3)
- Determine the dissolved oxygen, BOD and COD of water (K4)

List of Experiments:

- 1. Sampling of water for testing (Demonstration)
- 2. Determination of alkalinity or acidity
- 3. Determination of chlorides in water and soil
- 4. Determination and estimation of total solids, organic and inorganic solids, settle able solids
- 5. Determination of Iron
- 6. Determination of pH and Electrical Conductivity of water and soil
- 7. Determination of Optimum coagulant dose
- 8. Determination of Chlorine demand
- 9. Determination and estimation of total hardness calcium and magnesium
- 10. Determination of N, P, K values in solid waste
- 11. Physical parameters Temperature, colour, odour, turbidity, taste.
- 12. Presumptive Coliform test
- 13. Determination of Dissolved Oxygen and BOD
- 14. Determination of COD

List of Equipments:

- 1. pH Meter
- 2. Turbidity Meter
- 3. Conductivity Meter
- 4. Hot Air Oven
- 5. Muffle Furnace
- 6. Dissolved Oxygen Meter
- 7. U-V Visible Spectrophotometer
- 8. COD Reflux Apparatus
- 9. Jar Test Apparatus
- 10. BOD Incubator
- 11. Autoclave
- 12. Hazens Apparatus
- 13. Imhoff Cone

- 1. "Standard methods for analysis of water and waste water", APHA.
- 2. "Chemical analysis of water and soil", Murali Krishna, KVSG., Reem publications, New Delhi.

Sem	VI Sem	L	Т	Р	C	COURSE CODE	
Regulation	V20	0	0	3	1.5	V20CEL10	
Name of the	CAD & GIS LAB						
Course							
Branch	CIVIL ENGINEER	ING					

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

- Design 2D and 3D frames using STAAD PRO (K3)
- Design the retaining wall and simple towers using STAAD PRO (K3)
- Create thematic maps with relevant features (K5)
- Develop digital elevation models using GIS software (K3)

Note: Conduct any 10 experiments, 5 each from CADD software and GIS software.

COMPUTER AIDED DESIGN AND DRAWING SOFTWARE:

- STAAD PRO
- STRAAP
- STUDDS

List Of Experiments

- 2-D Frame Analysis and Design
- Steel Tabular Truss Analysis and Design
- 3-D Frame Analysis and Design
- Retaining Wall Analysis and Design
- Simple Tower Analysis and Design.
- Analysis of beam with different end conditions
- Analysis of multistoried building design
- Analysis of space stress
- Wind analysis of tall structure
- Analysis and design of elevated water tank

GEOGRAPHICAL INFORMATION SYSTEM SOFTWARE:

- Arc GIS 9.0
- ERDAS 8.7
- Mapinfo 6.5

List Of Experiments

- Georeferencing-toposheet
- Georeferencing-satellite image
- Creating a layer stack
- Extracting features-digitizing
- Map layout and analysis
- Raster supervised classification
- Raster unsupervised classification
- Raster Analysis- Urban Development
- Raster Analysis- Water bodies

- Creation of thematic maps.
- Estimation of features and interpretation
- Vector Analysis Route Map
- Vector Analysis village/ place/ point identification
- Creation of DEM (Digital Elevation Model)

- 1. Computer aided design lab (Civil) Engineering by shesha Prakash and suresh S.
- 2. Concept and Techniques of GIS' by C.P.L.O. Albert, K.W. Yong, Printice Hall Publishers.

Sem	VI Sem	L	Т	Р	С	COURSECOD		
						Ε		
Regulation	V20	0	0	3	1.5	V20CEL11		
Name of the	ESTIMATION, CONTRACTS & CONSTRUCTION							
Course	MANAGEMENT LAB							
Branch	CIVIL ENGINEEF	RING						

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

- Estimate the quantities of different items of construction work (K2)
- Analyze the cost of different items of construction work (K3)
- Compute the quantities for earth work of roads, canals (K3)
- Relate the specification of different works and make contract documents (K3)
- Employ different techniques in the process of construction planning and management (K3)

List of Work Practices

- Estimation of building using Individual Wall Method (two or more rooms)
- Estimation of building using Center Line Method (two or more rooms)
- Schedule of bar bending for beams and slab
- Earthwork estimation using different methods
 - Mid-sectional area method,
 - Mean sectional area method,
 - Trapezoidal rule,
 - Prismoidal rule
- Valuation of various items of work
- Preparation of Contract Document
- Project Network Techniques
 - Bar Chart Programme Evaluation and Review Technique
 - Critical Path Method
- Detailed study on Earth Work, Hoisting and Concreting Equipment's

- 1. "Estimating and Costing" by B.N.Dutta, UBS publishers, 2000.
- 2. "Estimating and Costing" by G.S.Birdie.
- "Method of Measurement of Building & Civil Engg Works IS1200 (Parts I to XXV-1974) "Estimation, Costing and Specifications" by M.Chakraborthi, Laxmi Publications.

Sem	VI Sem	L	Т	Р	С	COURSE CODE		
Regulation	V20	2	0	0	0	V20CEMC01		
Name of the	INTELLECTUAL DOODEDTV DICHTS & DATENTS							
Course	INTELLECTUAL PROPERTY RIGHTS & PATENTS							
Branch	CIVIL ENGINEER	ING						

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

- Describe the need of Intellectual Property Rights (K2)
- Generalize different issues regarding Copy Rights (K2)
- Employ the procedure for Patent registration and granting (K3)
- Discuss the importance of Trademark and its related issues (K2)
- Recognize the significance of Trade Secrets in Industry (K2)

SYLLABUS

UNIT I

Introduction to Intellectual Property Rights (IPR): Introduction to IPR, Evolutionary Past, Concept of IPR – Purpose of IPR, Types of IPR, WIPO -TRIPS, Nature of IPR, Patents, Trademarks, Copyrights, Neighboring Rights, Agencies responsible for IPR - Infringement, Use and Misuse of Intellectual Property Rights.

UNIT II

Copyrights: Introduction to Copyrights – Principles of Copyright Protection – Law Relating to Copyrights - Copyright Ownership – Transfer and Duration – Copyright Registration – Limitations – Infringement of Copyright – Relief and Remedy – Semiconductor Chip Protection Act.

UNIT III

Patents: Introduction to Patents - Laws Relating to Patents in India – Patent Requirements – Product Patent and Process Patent - Patent Registration and Granting of Patent -Exclusive Rights – Limitations - Ownership and Transfer – Revocation of Patent – Patent Appellate Board - Infringement of Patent – Compulsory Licensing – Software Protection and Computer related Innovations.

UNIT IV

Trademarks: Introduction to Trademarks – Laws Relating to Trademarks – Functions of Trademark – – Trade Mark Registration – Trade Mark Maintenance – Transfer of rights – Deceptive Similarities - Likelihood of Confusion - Dilution of Ownership – Trademarks Claims and Infringement – Remedies – Passing Off Action.

UNIT V

Trade Secrets: Introduction to Trade Secrets – General Principles - Laws Relating to Trade Secrets - Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreements – Breach of Contract –Law of

Unfair Competition – Trade Secret Litigation – Applying State Law, Cyber Law and Cyber Crime

Text Books:

- Intellectual Property Rights (Patents & Cyber Law), Dr. A. Srinivas. Oxford University Press, New Delhi.
- PrabhuddhaGanguli: Intellectual Property Rights, Tata Mc-Graw –Hill, New Delhi
- 3. R.Radha Krishnan, S.Balasubramanian: Intellectual Property Rights, Excel Books. New Delhi.

- 1. Deborah E.Bouchoux: Intellectual Property, Cengage Learning, New Delhi.
- 2. Richard Stim: Intellectual Property, Cengage Learning, New Delhi.
- Kompal Bansal &Parishit Bansal Fundamentals of IPR for Engineers,
 B. S. Publications (Press).
- 4. Cyber Law Texts & Cases, South-Western's Special Topics Collections.
- 5. M.Ashok Kumar and MohdIqbal Ali: Intellectual Property Rights, Serials Pub.

VII SEMESTER – SYLLABUS

Sem	VII Sem	L	Т	Р	С	COURSE CODE	
Regulation	V20	3	0	0	3	V20CET25	
Name of the	PRESTRESSED CONCRETE (Professional Elective – III)						
Course							
Branch	CIVIL ENGINEE	RING					

COURSE OUTCOMES:

Upon the successful completion of course students will be able to

- Discuss the basic concepts of prestressing system (K2)
- Analyze the effective prestress and bending stresses (K4)
- Analyze the deflections and flexural strength of prestressed concrete beams (K4)
- Analyze the prestressed concrete beams under Shear and torsion (K4)
- Design the end zone of prestressed concrete members (K5)

UNIT I

Introduction: Basic concepts of prestressing; Need for High strength steel and High strength concrete. Terminology; Advantages and Applications of Prestressed Concretes, Materials for prestressed Concrete: High strength concrete; High tensile steel.

Prestressing Systems: Prestressing Systems- Introduction, Tensioning devices, Pre-tensioning Systems, Post tensioning Systems

UNIT II

Analysis of Prestress and Bending Stresses: Basic assumptions; Analysis of prestress; Resultant stresses at a section; Pressure (Thrust) line and internal resisting couple; Concept of Load balancing.

Losses of Prestress: Nature of losses of prestress; 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.

UNIT III

Deflections of Prestressed Concrete Members: Importance of control of deflections; Factors influencing deflections; Short term deflections of un-cracked members; Effect of tendon profile on deflections.

Limit State of Collapse: Flexural Strength of Prestressed Concrete Sections: Ultimate flexural strength of rectangular sections and T-sections using simplified IS code recommendations.

UNIT IV

Limit State of Collapse: Shear Resistance of Prestressed Concrete Members: Shear and principal stresses; Shear- IS Code recommendations: Ultimate shear resistance of prestressed concrete members; Design of shear reinforcement.

Torsional Resistance of Prestressed Concrete Members: Design of reinforcements for torsion, shear and bending.

UNIT V

Design of End Blocks: Transmission of prestress in pretensioned members; Transmission length; Anchorage stress in post tensioned members; Bearing stress and bursting tensile force stresses in end blocks-Methods. IS Code provision for the design of end block reinforcement.

Text Books: (supplemented with IS: 1343)

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

- 2. Pre-stressed Concrete- P. Dayarathnam: Oxford and IBH Publishing Co.
- 3. Prestressed Concrete, S. Ramamrutham

- 1. Prestressed concrete by N. Rajagopalan; Narosa Publishing House.
- 2. Design of pre-stressed concrete structures- T.Y. Lin and Ned H. Burns John Wiley & Sons, New York.
- 3. Fundamental of pre-stressed concrete- N.C. Sinha & S.K. Roy
- 4. Prestressed Concrete, T. Y. Lin & Burns, Wiley Publications

Sem	VII Sem	L	Т	Р	С	COURSE CODE	
Regulation	V20	3	0	0	3	V20CET26	
Name of the Course	ADVANCED FOUNDATION ENGINEERING (Professional Elective – III)						
Branch	CIVIL ENGINEER	ING					

Upon successful completion of this course, the student will be able to

- Illustrate the safe bearing capacity and settlement of footings subjected to different types of loading (K3)
- Employ suitable techniques for proportioning the foundations laid on different soils strata (K3)
- Assess the forces acting on Earth Retaining Structures using different earth pressure theories (K3)
- Predict the load carrying capacity, pull-out capacity, negative skin friction of piles and their settlements (K3)
- Interpret different foundation practices in expansive soils (K3)

SYLLABUS

UNIT I

Bearing capacity of Foundation: using general bearing capacity equation– Meyerhof's, Brinch Hansen's and Vesic's methods-Bearing capacity of Layered Soils: Strong layer over weak layer, Weak layer on strong layer.

Settlement analysis: Immediate settlement, consolidate settlement, corrections, settlement of footings resting on granular soils and clay soils – Schmertmann & Hartman method – Janbu's method.

UNIT II

Mat foundations: Purpose and types of isolated and combined footings – Mats/Rafts – Proportioning of footings – Ultimate bearing capacity of mat foundations – allowable bearing capacity of mats founded in clays and granular soils– compensated rafts.

UNIT III

Earth-retaining structures: cantilever sheet piles – anchored bulkheads – fixed and free earth support methods – design of anchors – braced excavations – function of different components– forces in ties – stability against bottom heave.

UNIT IV

Pile foundations: single pile versus group of piles – load-carrying capacity of pile groups – negative skin friction (NSF) -settlement of pile groups in sands and clays – laterally loaded piles in granular soils – Reese and Matlock method – laterally loaded piles in cohesive soils– Davisson and Gill method – Broms'analysis.

UNIT V

Foundations in expansive soils: definitions of swell potential and swelling pressure – determination of free swell index – factors affecting swell potential and swelling pressure – foundation practices – sand cushion method – CNS layer – drilled piers and belled piers– under-reamed piles – moisture control methods.

Text Books:

- 1. Principles of Foundation Engineering, B M Das, CENTAG Learning
- 2. Soil Mechanics and Foundation Engineering, V N S Murthy, CBS Publishers
- 3. Basic and applied soil mechanics by Gopal Ranjan and ASR Rao, New Age Publishers

- 1. Foundation Analysis and Design, J.E.Bowles, JohnWiley
- 2. Foundation Design, W.C.Teng, Prentice Hall Publishers
- 3. Analysis and Design of Foundations and Retaining Structures by Prakash S edited by Saritha Prakashan

Sem	VII Sem	L	Т	Р	С	COURSE CODE	
Regulation	V20	3	0	0	3	V20CET27	
Name of the	GROUND WATER DEVELOPMENT						
Course	(Professional Elective – III)						
Branch	CIVIL ENGINEERING						

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

- Estimate aquifer parameters and its yield (K2)
- Design the wells and its associated components (K5)
- Generalize the well construction, development and its maintenance (K3)
- Organize the process of artificial recharge for increasing ground water potential (K3)
- Interpret geophysical exploration data for aquifers and their sources (K3)

SYLLABUS

UNIT I

Ground water and Well Hydraulics: Hydrologic Cycle -Groundwater in the hydrologic cycle, groundwater occurrence, aquifer parameters and their determination, general groundwater flow equation - Steady radial flow and unsteady radial flow to a well in confined and unconfined aquifers, Theis solution, Jocob and Chow's methods, Leaky aquifers.

UNIT II

Well Design: Water well design-well diameter, well depth, well screen-screen length, slot size, screen diameter and screen selection, design of collector wells, infiltration gallery.

UNIT III

Well Construction and Development: Water wells, drilling methods-rotary drilling, percussion drilling, well construction-installation of well screens-pullback method, open-hole, bail-down and wash-down methods, well development-mechanical surging using compressed air, high velocity jetting of water, over pumping and backwashing, well completion, well disinfection, well maintenance.

UNIT IV

Artificial Recharge: Concept of artificial recharge of groundwater, recharge methods-basin, Stream-channel, ditch and furrow, flooding and recharge well methods, recharge mounds and induced recharge.

Saline Water Intrusion: Occurrence of saline water intrusion, Ghyben- Herzberg relation, Shape of interface, control of saline water intrusion.

UNIT V

Geophysics: Surface methods of exploration of groundwater – Electrical resistivity and Seismic refraction methods, Sub-surface methods – Geophysical logging and resistivity logging, Aerial Photogrammetry applications.

Text Books:

- 1. 'Ground water' by Raghunath H M, New Age International Publishers, 2005.
- 2. 'Ground water Hydrology' by Todd D.K., Wiley India Pvt Ltd., 2014.

3. 'Ground water Hydrology' by Todd D K and L W Mays, CBSPublications, 2005.

References:

1. 'Groundwater Assessment and Management' by Karanth K R, Tata Mc Graw Hill Publishing Co., 1987.

2. 'Groundwater Hydrology' by Bouwer H, McGraw Hill Book Company, 1978.

3. 'Groundwater Systems Planning and Management' by Willis R and W.W.G. Yeh, Prentice Hall Inc., 1986.

4. 'Groundwater Resources Evaluation' by Walton W C, McGraw Hill Book Company, 1978.

Sem	VII Sem	L	Τ	Р	C	COURSE CODE		
Regulation	V20	3	0	0	3	V20CET28		
Name of the	HIGHWAY CONSTRUCTION AND MANAGEMENT							
Course	(Professional Elective – III)							
Branch	CIVIL ENGINEE	RING						

Upon the successful completion of course students will be able to

- Employ techniques in the planning of Base, Subbase and Shoulders of pavement (K2)
- Prepare a methodology in the laying of bituminous pavements (K3)
- Relate different concepts in the construction of Cement Concrete Pavements (K3)
- Prepare a procedure for the maintenance of Cement Concrete Pavements(K3)
- Develop proper Pavement Management Systems (K3)

SYLLABUS

UNIT I

Construction of Base, Subbase and Shoulders: Roadway and Drain Excavation, Excavation and Blasting, Embankment Construction, Construction of Gravel Base, Cement Stabilized Sub- Bases, WBM Bases, Wet Mix Construction; Crushed Cement Bases, Shoulder Construction.

UNIT II

Bituminous Construction: Preparation and Laying of Tack Coat; Bituminous Macadam, Penetration Macadam, Built up Spray Grout, Open Graded Premix, Mix Seal, Semi-Dense Asphalt Concrete-Interface Treatments and Overlay Construction, IRC Specifications.

UNIT III

Cement Concrete pavement Construction: Cement Concrete Pavement Analysis - Construction of Cement Roads, Manual, and Mechanical Methods, Joints in Concrete and Reinforced Concrete Pavement and Overlay Construction.

UNIT IV

Bituminous and Cement Concrete pavement Maintenance: Repair of surface layer, Base layer, sub base layer, Sub grade, Maintenance of Concrete slab, Dry Lean concrete sub base layer and Subgrade in concrete pavement.

UNIT V

Pavement Management Systems: Pavement Management Systems- Components, structure, data requirements, Project level and Network level needs, Pavement performance prediction – concepts, modelling techniques, Budget forecasting for maintenance and rehabilitation.

Text Books :

1. Highway Engineering, Khanna S. K., Justo C. E. G and Veeraragavan A, Nem Chand Bros., Roorkee.

- 2. Ralph C.G. Haas, W. Ronald Hudson and Zanieswki "Modern Pavement Management", Mc Graw Hill and Co,1994
- 3. Principles of Highway Engineering, Kadiyali L. R, Khanna Publishers, New Delhi.
- 4. MORTH Specifications.

- 1. Principles of Transportation Engineering, Partha Chakroborthy and Animesh Das, PHI Learning Private Limited, Delhi.
- 2. Transportation Engineering An Introduction, Jotin Khisty C, Prentice Hall, Englewood Cliffs, New Jersey.
- 3. Transportation Engineering and Planning, Papacostas C.S. and P.D. Prevedouros, Prentice Hall of India Pvt.Ltd; New Delhi.

Sem	VII Sem	L	Τ	Р	С	COURSE CODE	
Regulation	V20	3	0	0	3	V20CET29	
Name of the	ENVIRONMENTAL IMPACT ASSESSMENT AND						
Course	MANAGEMENT (Professional Elective – III)						
Branch	CIVIL ENGINEERING						

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

- Prepare different reports related to EMP, EIS, and EIA (K3)
- Select an appropriate EIA methodology (K2)
- Assess the Impact of development activities and land use (K3)
- Employ in procuring the natural resources and assessment of Eco system (K3)
- Develop the EIA notifications and reports (K3)

SYLLABUS

UNIT I

Basic concept of EIA: Elements of EIA-factors affecting EIA-Initial environmental Examination-life cycle analysis preparation of Environmental Base map-Classification of environmental parameters role of stakeholders in the EIA preparation stages in EIA

UNIT II

E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis – EIS and EMP

UNIT III

Impact of Developmental Activities and Land use: Introduction and Methodology for the assessment of soil and ground water, Delineation of study area, Identification of actives- application of remote sensing and GIS for EIA.

UNIT IV

Procurement of natural resources and assessment of eco system: Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures - E I A with reference to surface water, Air and Biological environment – wild life - deforestration

Environmental Risk Assessment and management: Risk assessment and treatment of uncertainty-key stages

UNIT V

EIA notification: EIA notification by Ministry of Environment and Forest (Govt. of India): Provisions in the EIA notification, procedure for environmental clearance, and procedure for conducting environmental impact assessment report- evaluation of EIA report. Environmental legislation objectives, evaluation of Audit data and preparation of Audit report. Post Audit activities, Concept of ISO and ISO 14000, Case studies and preparation of Environmental Impact assessment statement for various Industries.

Text Books:

1. Environmental Impact Assessment, Canter Larry W., McGraw-Hill education Edi (1996)

2. Environmental Impact Assessment Methodologies, Y.Anjaneyulu, B. S. Publication, Sultan Bazar, Hyderabad.

3. Environmental Impact Assessment and Management, B B Hosetti, A.Kumar, Daya Publishing House (2014)

References:

1. Environmental Science and Engineering, J. Glynn and Gary W. Hein Ke PrenticeHall Publishers

2. Environmental Science and Engineering, Suresh K. Dhaneja, S. K. ,Katania& Sons Publication., New Delhi.

3. Environmental Pollution and Control, H. S. Bhatia, Galgotia Publication (P) Ltd, Delhi

Sem	VII Sem	L	Т	Р	С	COURSE CODE		
Regulation	V20	3	0	0	3	V20CET30		
Name of the	FINITE ELEMENT METHOD							
Course	(Professional Elective – IV)							
Branch	CIVIL ENGINEERING							

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

- Generalize the concept of Finite Element Method (K2)
- Employ different formulation techniques of FEM to the engineering problems (K3)
- Assess one dimensional solid elements of various practical problems (K3)
- Analyze different components of framed structure (K4)
- Analyze the two and three dimensional solids using FEM (K4)

SYLLABUS

UNIT I

Introduction to Finite Element Analysis: Basic Concepts of Finite Element Analysis - Introduction to Elasticity -Steps in Finite Element Analysis

UNIT II

Finite Element Formulation Techniques: Virtual Work and Variational Principle - Galerkin Method- Finite Element Method: Displacement Approach -Stiffness Matrix and Boundary Conditions

UNIT III

Element Properties: Natural Coordinates -Triangular Elements - Rectangular Elements - Lagrange and Serendipity Elements -Solid Elements - Isoparametric Formulation -Stiffness Matrix of Isoparametric Elements - Numerical Integration: One Dimensional - Numerical Integration: Two and Three Dimensional- Worked out Examples

UNIT IV

Analysis of Frame Structures: Stiffness of Truss Members -Analysis of Truss -Stiffness of Beam Members - Finite Element Analysis of Continuous Beam -Plane Frame Analysis - Analysis of Grid and Space Frame

UNIT V

FEM for Two and Three Dimensional Solids: Constant Strain Triangle - Linear Strain Triangle - Rectangular Elements - Numerical Evaluation of Element Stiffness - Computation of Stresses, Geometric Nonlinearity and Static Condensation - Axisymmetric Element - Finite Element Formulation of Axisymmetric Element - Finite Element Formulation for 3 Dimensional- Elements Worked out Examples

Text Books:

1. Introduction to Finite Elements in Engineering, Tirupati R. Chandrupatla, Ashok D. Belgundu, PHI publications.

2. A first course in the Finite Element Method, Dary L. Logan, Thomson Publications.

- 3. The Finite Element Method- Zinkiewicz, O.C. and Taylor, R.L, Oxford.
- 4. Finite Element Analysis Theory and Programming- Krishnamoorthy, C.S, Tata McGraw-Hill Education.

- 1. Concepts and applications of Finite Element Analysis, Robert D. Cook, Michael E Plesha, John Wiley & sons Publication .
- 2. Introduction to Finite Element Method, Desai & Abel CBS Publication.
- 3. Introduction to Finite Element Method- P.N. Godbole, I K International Publishing House Pvt. Ltd.
- 4. The Finite Element Method in Engineering- S.S. Rao, Butterworth-Heinemann;
- 5. An Introduction to Finite Element Method- Reddy, J. N., McGraw-Hill Education

Sem		VII Sem	L	Т	Р	С	COURSE CODE		
Regulation		V20 3 0 0 3 V20CET31							
Name of	the	ENGINEERING WITH GEO-SYNTHETICS							
Course		(Professional Elective – IV)							
Branch		CIVIL ENGINEERING							

Upon successful completion of this course, the students will be able to

- Relate the need and demand of geo-synthetic materials in the field of geotechnical related works (K3)
- Apply the geotextiles and geogrids to practical problems (K3)
- Interpret the functions and applications of Geomembranes and Geocomposites (K3)
- Assess the internal and external stability of Reinforced Earth Retaining Wall (K3)
- Examine the applications of geo-synthetics in road construction (K3)

SYLLABUS

UNIT I

Geosynthetics: Introduction to Geosynthetics – Basic description – Polymeric materials– Uses and Applications, Properties of Geotextiles – Geogrids – Geomembranes – Geocomposites.

UNIT-II

Geotextiles: Design criteria for Separation – Reinforcement – Stabilization – Filtration – Drainage and Moisture barriers.

Natural Geotextiles: Natural fibres as geotextiles- factors governing the use jute fibres-coir geotextiles-bamboo/timber-combination of geotextiles.

Geogrids: Designing for Reinforcement – Stabilization – Designing Gabions – Construction methods.

UNIT-III

Geomembranes: Pond Liners – Covers for Reservoirs – Canal Liners – Landfill Liners – Caps and closures, moisture barriers.

Geocomposites: An added advantage – Geocomposites in Separation – Reinforcement – Filtration – Geocomposites as Geowebs and Geocells.

UNIT-IV

Reinforced Earth Retaining Walls: Components - External stability – Internal stability - Design of reinforced earth walls with strip, sheet and grid reinforcement.

UNIT-V

Use of Geosynthetics in Roads: Geosynthetics in road ways- applications role of subgrade conditions-design criteria-survivability-application in paved roads.

Text Books:

1. Designing with Geosynthetics by Robert M. Koerner, Prantice Hall, Eaglewood Cliffs, NJ.

2. An Introduction to Soil Reinforcement and Geosynthetics' by G.L.Sivakumar Babu (2009), Universities Press (India) Pvt. Ltd.

3. Engineering with Geosynthetics', by G. Venkatappa Rao and GVS Suryanarayana Raju – Tata McGraw Hill Publishing Company Limited – New Delhi.

References:

1. 'Construction and Geotechnical Engineering using Synthetic Fabries' by Robert M. Koerner and Josoph P. Welsh. John Willey and Sons, New York.

2. 'Foundation Analysis and Design' by J.E. Bowles McGraw Hill Publications.

Sem	VII Sem	L	Τ	Р	C	COURSE CODE		
Regulation	V20	3	0	0	3	V20CET32		
Name of the	URBAN TRANSPORTATION PLANNING							
Course	(Professional Elective – IV)							
Branch	CIVIL ENGINEE	RING						

Upon successful completion of this course, the students will be able to

- Employ the Urban Transportation Problems & Travel Demand (K3)
- Relate the techniques in the data collection for planning the network (K3)
- Develop various models for trip generation, trip distribution and traffic assignment (K3)
- Prepare various alternative transportation proposals (K3)
- Solve the traffic assignment for transport network (K5)

SYLLABUS

UNIT I

Urban Transportation Problems & Travel Demand: Urban Issues, Travel Characteristics, Evolution of Planning Process, Supply and Demand – Systems approach; Trends, Overall Planning process, Long term Vs Short term planning, Demand Function, Independent Variables, Travel Attributes, Assumptions in Demand Estimation, Sequential, and Simultaneous Approaches, Aggregate and Disaggregate Techniques.

UNIT II

Data Collection and Inventories: Collection of data – Organisation of surveys and Analysis, Study Area, Zoning, Types and Sources of Data, Road Side Interviews, Home Interview Surveys, Commercial Vehicle Surveys, Sampling Techniques, Expansion Factors, Accuracy Checks, Use of Secondary Sources, Economic data – Income – Population – Employment – Vehicle Owner Ship.

UNIT III

Trip Generation & Distribution: UTPS Approach, Trip Generation Analysis: Zonal Models, Category Analysis, Household Models, Trip Attraction models, Commercial Trip Rates; Trip Distribution: Growth Factor Methods, Gravity Models, Opportunity Models, Time Function Iteration Models.

UNIT IV

Mode Choice Analysis: Mode Choice Behaviour, Competing Modes, Mode Split Curves, Aggregate and Disaggregate Approaches; Discrete Choice Analysis, Choice sets, Maximum Utility, Probabilistic Models: Binary Logit, Multinomial Logit Model – IIA property; Aggregation

UNIT V

Traffic Assignment: Diversion Curves; Basic Elements of Transport Networks, Coding, Route Properties, Path Building Criteria, Skimming Tree, All-or-Nothing Assignment, Capacity Restraint Techniques, Reallocation of Assigned Volumes, Equilibrium Assignment. **Corridor Identification, Plan Preparation & Evaluation**: Master plans, Selection of Corridor, Corridor Identification, Corridor deficiency Analysis; Travel Forecasts to Evaluate Alternative Improvements, Impacts of New Development on Transportation Facilities. Pivot Point Analysis, Environmental and Energy Analysis; Case studies

Text Books:

- 1. Introduction to Urban System Planning, Hutchinson, B.G., McGraw Hill.
- 2. Transportation Engineering An Introduction, Khisty C.J., Prentice Hall

- 1. Introduction to Transportation Planning, Bruton M.J., Hutchinson of London.
- 2. Fundamentals of Transportation Planning, Papacostas, Tata McGraw Hill
- 3. Urban Transportation Planning: A decision oriented Approach, Mayer M and Miller E, McGraw Hill
- 4. Traffic Engineering and Transportation Planning, Kadiyali.L.R., Khanna Publishers, New Delhi.
- 5. Metropolitan Transportation Planning, Dicky, J.W., Tata McGraw Hill

Sem	VII Sem	L	Т	Р	С	COURSE CODE		
Regulation	V20	3	0	0	3	V20CET33		
Name of the	SOLID WASTE MANAGEMENT							
Course	(Professional Elective – IV)							
Branch	CIVIL ENGINEE	RING						

Upon successful completion of this course, the students will be able to

• Relate the factors influencing generation of solid waste and its management (K3)

• Assess the basic elements for managing the Solid Waste (K3)

• Develop different methods for transportation and transformation of solid waste (K3)

• Prepare different methods for processing and treatment of municipal solid waste (K3)

• Find suitable disposal methods with respect to solid waste (K3)

SYLLABUS

UNIT I

Introduction to Solid Waste Management: Goals and objectives of solid waste management, Classification of Solid Waste – Factors Influencing generation of solid waste – sampling and characterization –Future changes in waste composition, major legislation, monitoring responsibilities.

UNIT II

Basic Elements In Solid Waste Management: Elements and their inter relationship – principles of solid waste management- onsite handling, storage and processing of solid waste Collection of Solid Waste: Types and methods of waste collection systems, analysis of collection system – optimization of collection routes.

UNIT III

Transportation and Transformation of Solid Waste: Need for transfer operation, compaction of solid waste – transport means and methods, transfer station types and design requirements.

Unit operations used for separation and transformation: shredding – materials separation and recovery, source reduction and waste minimization.

UNIT IV

Processing and Treatment: Processing of solid waste – Waste transformation through combustion and composting, anaerobic methods for materials recovery and treatment – Energy recovery – biogas generation and cleaning– Incinerators.

UNIT V

Disposal of Solid Waste: Methods of Disposal, Landfills: Site selection, design and operation, drainage and leachate collection systems –designated waste landfill remediation.

Text Books:

- 1. "Integrated Solid Waste Management", George Techobanoglous, McGraw Hill Publication, 1993
- 2. "Environmental Engineering", Gerard Kiely, McGraw Hill Publication, 2007
- 3. "Environmental Science and Engineering", J Glynn Henry, Gary W.Heinke, Prentice-Hall of India Pvt Ltd, 1996

- 1. "Solid Waste Engineering", Vesilind, P.A., Worrell, W., Reinhart, D., Cenage learning, New Delhi, 2004
- 2. "Hazardous Waste Management", Charles A. Wentz., McGraw Hill Publication, 1995.
- 3. "Introduction to Environmental Engineering" Mackenzie L Davis, David A.Cornwell, McGraw Hill Publication, 2017

Sem	VII Sem	L	Т	Р	С	COURSE CODE		
Regulation	V20	3	0	0	3	V20CET34		
Name of the	PREFABIRCATED STURCTURES							
Course	(Professional Elective – IV)							
Branch	CIVIL ENGINEERING							

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

- Relate the principles of prefabrication, production and erection processes (K3)
- Practice different ways to utilize prefabricated components (K3)
- Design the prefabricated components to mount on the precast concrete system (K5)
- Prepare types of joints and connections to accommodate in precast system (K3)
- Use codal provisions to avoid progressive collapse to abnormal loads (K3)

SYLLABUS

UNIT I

Introduction: Need for prefabrication – Principles of prefabrication – Modular coordination – Standardization – Materials – Systems – Production – Transportation – Erection.

UNIT II

Prefabricated Components: Behavior and types of structural components – Large panel systems – roof and floor slabs – Walls panels - Beams - Columns - Shear walls

UNIT III

Design Principles: Design philosophy- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation - Demountable precast concrete systems.

UNIT IV

Joints and Connections in Structural Members: Types of Joints – based on action of forces - compression joints - shear joints - tension joints - based on function - construction, contraction, expansion, Design of expansion joints - Dimensions and detailing - Types of sealants - Types of structural connections - Beam to Column - Column to Column - Beam to Beam - Column to foundation.

UNIT V

Design for Abnormal Loads: Progressive collapse – Codal provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., - Importance of avoidance of progressive collapse.
1. "Prefabrication with Concrete", Bruggeling A.S. G and Huyghe G.F., A.A. Balkema Publishers, USA,1991.

2. "Precast Concrete- Materials, Manufacture, Properties And Usage", Lewitt,M., Applied Science Publishers, London and New Jersey, 1982.

3. "Precast Concrete Structures", Bachmann, H. and Steinle, A., Ernst &Sohn, Berlin, 2011.

References:

1. "Manual of precast concrete construction", Koncz T., Vol. I, II and III, Bauverlag, GMBH, 1976.

2. "Handbook on Precast Concrete Buildings", Indian Concrete Institute, 2016.

3. "Structural design manual", Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland BetorVerlag, 2009

Sem	VII Sem	L	Т	Р	С	COURSE CODE	
Regulation	V20	3	0	0	3	V20CET35	
Name of the	EARTHQUAKE ENGINEERING						
Course	(Professional Ele	ctive –	V)				
Branch	CIVIL ENGINEERING						

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

- Discuss the basic concept and characteristics of earth quakes (K2)
- Examine the ground motion and seismic hazard (K3)
- Assess the frequency of wave propagation in different mediums (K3)
- Illustrate the behavior and resistive forces generated in the structure during earthquake (K3)
- Relate the possibility of liquefaction and ground improvement for remediation of seismic hazards (K3)

SYLLABUS

UNIT I

Introduction to Dynamic Loads: Static Load v/s Dynamic Load, Types of Dynamic forces, Force Control and Displacement Control.

Seismology and Earthquakes: Introduction, Seismic Hazards, seismic waves, internal structure of earth, Continental drift and plate tectonics, faults, elastics rebound theory, geometric notations, location of earthquakes, size of earthquakes.

UNIT II

Strong Ground Motion: Strong ground motion measurement, ground motion parameters, estimation of ground motion parameters.

Seismic Hazard Analysis: Identification and Evaluation of Earthquake Sources, deterministic seismic hazard analysis, probabilistic seismic hazard analysis.

UNIT III

Wave Propagation: Waves in unbounded media, waves in a semi – infinite body, waves in a layered media, attenuation of stress waves.

Artificial Ground Motion Generation: Modification of actual ground motion records, time –domain generation, frequency domain generation.

UNIT IV

Behavior of Structures: During Earthquake and Earthquake Resistant Features of Structure Inertia forces in structures, Behavior of Masonry Structures, Behavior of RC Structures

Liquefaction: Flow liquefaction, cyclic mobility, evaluation of liquefaction hazards, liquefaction susceptibility, initiation of liquefaction, effects of liquefaction.

Soil Improvement for Remediation of Seismic Hazards: Densification techniques, Reinforcement Techniques, Grouting and Mixing techniques, Drainage techniques.

Text Books:

- 1. Earthquake Resistant Design of Structures By Pankaj Agarwal & Manish Shrikhande, PHI Publications
- 2. S. K. Duggal; Earthquake Resistance Design of Structures; Oxford University Press, New Delhi.
- 3. K. Chopra; Dynamics of Structures, Pearson, New Delhi
- 4. Park & Pauly; Behavior of R.C Structures
- 5. Geotechnical Earthquake Engineering by Steven L. Kramer, prentice Hall

Reference Books:

- 1. IS: 1893 (Part-I) 2002, Criteria for Earthquake Resistant Design General Provision to Building.
- 2. S: 13920 (1993), Code of Practice for Ductile Detailing of RC Structures
- 3. IS: 4326 (1993), Code of Practice for Earthquake Resistant Design and Construction of Buildings
- 4. IS: 13827 (1993), Improving Earthquake Resistance of Earthen Buildings
- 5. IS: 13828 (1993), Guide lines for Improving Earthquake Resistance of low Strength Masonry Buildings.
- 6. S S Rao; Mechanical Vibration; Pearson, New Delhi.

Sem	VII	L	Τ	Р	С	COURSE CODE			
Regulation	V20	3	0	0	3	V20CET36			
Name of the	GROUND IMPROVEMENT TECHNIQUES								
Course	(Professional Ele	(Professional Elective – V)							
Branch	CIVIL ENGINEE	RING							

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

- Employ the in-situ densification methods at ground surface and at depth (K3)
- Relate the importance of dewatering and different methods of stabilization (K3)
- Illustrate the reinforced earth technology and soil nailing to obviate the problems posed by conventional retaining walls (K3)
- Use the geosynthetics to improve the engineering performance of soils (K3)
- Select different techniques of grouting to solve the ground problems (K3)

SYLLABUS

UNIT I

In situ densification methods: In situ densification of granular soilsvibration at ground surface and at depth, impact at ground and at depth – in situ densification of cohesive soils – pre loading – vertical drains – sand drains and geo drains – stone columns.

UNIT II

Dewatering: Sumps and interceptor ditches – single and multi stage well points – vacuum well points – horizontal wells– electro osmosis

Stabilization of soils: Methods of soil stabilization – mechanical – cement – lime – bitumen and polymer stabilization – use of industrial wastes like fly ash and granulated blast furnace slag.

UNIT III

Reinforced earth: Principles – components of reinforced earth –stability checks – soil nailing

UNIT IV

Geosynthetics: Geotextiles – types – functions, properties and applications – geogrids, geomembranes and gabions – properties and applications.

UNIT V

Grouting: Objectives of grouting – grouts and their applications – methods of grouting – stage of grouting.

- 1. Ground Improvement Techniques, Purushotham Raj, Laxmi Publications, New Delhi.
- 2. Ground Improvement Techniques, Nihar Ranjan Patro, Vikas Publishing House (p) limited , New Delhi.
- 3. An introduction to Soil Reinforcement and Geosynthetics, G. L. Siva Kumar Babu, Universities Press.

- 1. Ground Improvement, M.P.Moseley, Blackie Academic and Professional, USA
- 2. Designing with Geosynethetics, R. M Koerner, Prentice Hall
- 3. Engineering Principles of Ground Modification by Manfred R. Hausmann,McGraw-Hill Inc.,

Sem	VII Sem	L	Τ	Р	С	COURSE CODE			
Regulation	V20	3	0	0	3	V20CET37			
Name of the	RURAL WATER	RURAL WATER SUPPLY AND ONSITE SANITATION							
Course	SYSTEMS (Professional Elective - V)								
Branch	CIVIL ENGINEERING								

Upon the successful completion of course students will be able to

- Generalize the concept and scope of sanitation in rural areas (K2)
- Apply suitable methods of water treatment for rural areas (K3)
- Develop the water distribution system in rural areas (K3)
- Relate the different public sanitation methods in rural areas and industrial zones (K3)
- Relate different methods of solid waste management in rural areas (K3)

SYLLABUS

UNIT I

Concept of environmental and scope of sanitation in rural areas: Magnitude of problem of water supply and sanitation – population to be covered and difficulties National policy, Various approaches for planning of water supply systems in rural areas, Selection and development of preferred sources of water, springs, wells and infiltration galleries, collection of raw water from surface source.

UNIT II

Specific problems: Specific problems in rural water supply and treatment iron, manganese, fluorides etc., Low cost treatment, appropriate technology for water supply and sanitation, Improvised method and compact system of treatment of surface and ground waters such as MB settlers, slow and sand filter, chlorine diffusion cartridge etc., Water supply through spot sources, hand pumps, open dug –well.

UNIT III

Planning of distribution system in rural areas: Water supply during fairs, festivals and emergencies, Treatment and disposal of wastewater/sewage, various method of collection and disposal of night soil

UNIT IV

Rural sanitation and industrial hygiene: Simple wastewater treatment system for rural areas and small communities such as stabilization ponds, septic tanks, soakage pits etc., Occupational Hazards- Schools- Public Buildings- Hospitals- Eating establishments- Swimming pools – cleanliness and maintenance and comfort- Industrial plant sanitation

UNIT V

Solids Waste: Collection, Transfer, Transport and deposit of solid waste

management, composting, land filling.

- 1. "Water Supply and Sanitary Engineering" by Rangwala, Charotar Publishing House Pvt Ltd.,
- 2. "Water Supply and Sanitary Engineering" by G.S.Birdie and J.S.Birdie, Dhanpat Rai Publishing Company

References:

1. "Manual of water supply and treatment", 3rd edition, CPHEEO, GOI, New Delhi.

2. "Solid Waste Engineering", Vesilind, P.A., Worrell, W., Reinhart, D., Cenage learning, New Delhi, 2004

Sem	VIISem	L	Τ	Р	С	COURSE CODE		
Regulation	V20	3	0	0	3	V20CET38		
Name of the	METRO SYSTEMS AND ENGINEERING							
Course	(Professional Ele	(Professional Elective – V)						
Branch	CIVIL ENGINEER	ING						

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

- Generalize different Metro Systems and their planning (K2)
- Relate construction methods of elevated and under ground stations (K3)
- Employ the construction quality and safety systems (K3)
- Illustrate the methods to utilize electronic signaling systems and automatic fare collection systems (K3)
- Organize the mechanical and electrical work of different systems (K3)

SYLLABUS

UNIT I

General: Overview of Metro Systems; Need for Metros; Routing studies; Basic Planning and

Financials

UNIT II

Construction Methods: Civil Engineering- Overview and construction methods for elevated and underground stations; Viaduct spans and bridges; Underground tunnels; Depots; Commercial and Service buildings, Initial Surveys & Investigations;

UNIT III

Quality & Safety Systems: Basics of Construction Planning & Management, Construction Quality & Safety Systems, Traffic integration, multimodal transfers and pedestrian facilities; Environmental and social safe guards; Track systems-permanent way. Facilities Management

UNIT IV

Operation Control Center: Electronics and Communication Engineering-Signaling systems; Automatic fare collection; Operation Control Centre (OCC and BCC); SCADA and other control systems; Platform Screen Doors.

UNIT V

Mechanical & Rolling Stock: Mechanical & TVS, AC: Rolling stock, vehicle dynamics and structure; Tunnel Ventilation systems; Air conditioning for stations and buildings; Fire control systems; Lifts and Escalators.

Electrical: OHE, Traction Power; Substations- TSS and ASS; Power SCADA; Standby and Back - up systems; Green buildings, Carbon credits and clear air mechanics.

- 1. "Metro Rail in India for Urban Mobility", by MM Agarwal, Sudhir Chandra and KK Miglani – Prabha& Co, 2021
- 2. "World Metro Systems", Paul Garbutt, Capital Transport Pub; 2nd Edition, 1997.

- 1. General & Technical information of Hyderabad Metro
- 2. General & Technical information of Delhi Metro

Sem	VII Sem	L	Т	Р	С	COURSE CODE			
Regulation	V20	3	0	0	3	V20CET39			
Name of the	ARCHITECTUR	ARCHITECTURE AND TOWN PLANNING							
Course	(Professional Elective – V)								
Branch	CIVIL ENGINEERING								

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

- Distinguish architectural styles of eastern and western world (K2)
- Understand the importance of Orders of architecture (K2)
- Develop spaces of buildings using design concepts, planning principles (K3)
- Relate the present town planning from ancient times to modern times.
- Interpret the town planning standards, landscaping features and regulations controlling expansion of the towns and the cities (K3)

SYLLABUS:

UNIT I

History of Architecture: Western Architecture: Egyptian, Greek, Roman Architectures- Orders. Indian Architecture: Vedic age, Indus valley civilization– Buddhist period: Stambas, Stupa, Toranas, Chaityas, Viharas – Hindu temples: Dravidian and Indo Aryan Styles-Temple of Aihole, Madurai, Bhuvaneshwar, Mount Abu. Indo Sarsanic (Islamic) Architecture: Mosque -Palace - Fort - Tomb.

UNIT II

Architectural Design: Principles of designing – Composition of Plan – relationship between plan and elevation- building elements, form, surface texture, mass, line, color, tone- Principles of Composition: Unity, contrast, proportion, scale, balance, circulation, rhythm, character, expression.

UNIT III

Principles of Planning: Principles of planning a residence- site selection, site orientation- aspect, prospect, grouping, circulation, privacy, furniture requirements, services and other factors. Post-classic Architecture: Introduction of post-classic architecture contribution of eminent architects to modern period-Edward Lutyens, Le Corbusier, Frank Lloyd Wrigt, Walter Groping.

UNIT IV

Historical Back Ground of Town Planning: Town planning in India – Town plans of mythological Manasa - Town plans of ancient towns: Harappa, Mohenjodaro, Pataliputra, Delhi, Acropolis (Greece), Jerusalem, Mecca, Rome, London.

Modern Town Planning: Zoning- Roads and road traffic- Housing- Slums, Parks, Play grounds- Public Utility Services- Surveys and maps for planning Neighborhood Planning. Standards of Town planning: Planning new towns, planning standards and specifications, national and regional planning, town planning and legislation planning regulations and limitations.

Land Scaping and Expansion of Towns: Land scaping for the towns, horizontal and vertical expansion of towns- garden cities, satellite towns floating towns- sky scrapers-pyramidal cities.

Text Books:

1. 'The great ages of World Architecture' by G.K. Hiraskar.

2. 'Planning and Design of Buildings by Section of Architecture' by Y. S. Sane., Civil Engineering 142

3. 'Professional Practice' by G.K. Krishnamurthy, S.V. Ravindra, PHI Learning, New Delhi.

4. 'Indian Architecture – Vol. I & II' by Percy Brown, Taraporevala Publications, Bombay.

5. 'Fundamentals of Town Planning' by G.K. Haraskar.

References:

1. 'Drafting and Design for Architecture' by Hepler, Cengage Learning

2. 'Architect's Portable Handbook' by John Patten Guthrie – Mc Graw Hill International Publications.

3. 'Modern Ideal Homes for India' by R. S. Deshpande.

4. 'Town and County Planning' by A.J.Brown and H.M.Sherrard.

5. 'Town Design' by Federik Glbbard, Architectural press, London.

ANNEXURE - III COURSES OFFERED UNDER OPEN ELECTIVE IN V, VI & VII SEMESTER TO OTHER BRANCHES

Name of the Course	Course code
1. Repair and Rehabilitation of	
Structures	V20CEOE01
2. Ground Improvement Techniques	V20CEOE02
3. Environmental Pollution and Control	V20CEOE03
4. Building Materials and Construction	V20CEOE04
5. Remote Sensing and GIS	V20CEOE05
6. Solid Waste Management	V20CEOE06
7. Disaster Management	V20CEOE07
8. Water Quality and Conservation	V20CEOE08
Systems	

COURSES OFFERED UNDER MANDATORY COURSES IN V, VI & VII SEMESTER TO OTHER BRANCHES

Name of the Course	Course code
1. Intellectual Property Rights & Patents	V20CEMC01
2. Professional Ethics & Human Values	V20CEMC02

	Open meet					
Sem	V/VI/VII	L	Т	Р	С	COURSE CODE
Regulation	V20	3	0	0	3	V20CEOE01
Name of the Course	REPAIR AND H	REHAB	ILITA	ΓΙΟΝ (OF SI	RUCTURES
Branch	EXCEPT CE					

Open Elective -I

Course Outcomes:

Upon the successful completion of course students will be able to

- Develop various maintenance and repair strategies (K2)
- Evaluate the existing buildings through field investigations (K2)
- Understand and use the different techniques for structural rehabilitation and various techniques of repair (K2)
- Understand the importance of advanced concretes mixes(K2)
- Understand the importance of high performance concretes(K2)

SYLLABUS

UNIT I

Deterioration of Structures and diagnosis: Distress in Structures – Causes and Prevention. Mechanism of Damage – Types of Damage, Non Destructive Testing, Corrosion of Steel Reinforcement – Causes – Mechanism and Prevention. Damage of Structures due to Fire – Fire Rating of Structures – Inspection and Testing – Symptoms and Diagnosis of Distress – Damage assessment –

UNIT II

Materials for repair and rehabilitation: Admixtures- types of admixtures - purposes of using admixtures- chemical composition- Natural admixtures - Fibres- wraps- Glass and Carbon fibre wraps- Steel Plates

UNIT III

Strengthening and stabilization: Techniques- design considerations-Beam shear capacity strengthening - Shear Transfer strengthening-stress reduction techniques- Column strengthening-flexural strengthening - Connection stabilization and strengthening, Crack stabilization

UNIT IV

Special Concretes: Fibre reinforced concrete: Properties of constituent materials- Mechanical properties of fiber reinforced concrete- applications of fibre reinforced concretes-Light weight concrete- properties of light weight concrete- No fines concrete- design of light weight concrete- Flyash concrete - classification of flyash- Properties of flyash concrete

High performance concretes: Introduction- Development of high performance concretes- Materials of high performance concretes- Properties of high performance concretes- Self Consolidating concrete-properties-qualifications.

Text Books:

1. Maintenance and Repair of Civil Structures, B.L. Gupta and Amit Gupta, Standard Publications.

2. Concrete Technology by A.R. Santa Kumar, Oxford University press

3. Concrete technology by Neville and J J Brooks, Pearson publications, 2nd edition

- 1. Concrete technology by M S Shetty, S. Chand publications (2006).
- 2. Defects and Deterioration in Buildings, EF & N Spon, London
- 3. Non-Destructive Evaluation of Concrete Structures by Bungey Surrey University Press
- 4. Concrete Repair and Maintenance Illustrated, RS Means Company Inc W.H.Ranso, (1981)
- 5. Building Failures: Diagnosis and Avoidance, EF & N Spon, London, B.A. Richardson, (1991)

Sem	V/VI/VII	L	Т	Р	C	COURSE CODE	
Regulation	V20	3	0	0	3	V20CEOE02	
Name of the		OVEMI		ECUNI	IUILE	c	
Course	GROUND IMPR	UVENI		ECHN	QUE	3	
Branch	EXCEPT CE						

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

- Employ the in-situ densification methods at ground surface and at depth (K3)
- Relate the importance of dewatering and different methods of stabilization (K3)
- Illustrate the reinforced earth technology and soil nailing to obviate the problems posed by conventional retaining walls (K3)
- Use the geosynthetics to improve the engineering performance of soils (K3)
- Select different techniques of grouting to solve the ground problems (K3)

SYLLABUS

UNIT I

In situ densification methods: In situ densification of granular soilsvibration at ground surface and at depth, impact at ground and at depth – in situ densification of cohesive soils – pre loading – vertical drains – sand drains and geo drains – stone columns.

UNIT II

Dewatering: Sumps and interceptor ditches – single and multi stage well points – vacuum well points – horizontal wells– electro osmosis

Stabilization of soils: Methods of soil stabilization – mechanical – cement – lime – bitumen and polymer stabilization – use of industrial wastes like fly ash and granulated blast furnace slag.

UNIT III

Reinforced earth: Principles – components of reinforced earth –stability checks – soil nailing

UNIT IV

Geosynthetics: Geotextiles – types – functions, properties and applications – geogrids , geomembranes and gabions – properties and applications.

UNIT V

Grouting: Objectives of grouting – grouts and their applications – methods of grouting – stage of grouting.

- 1. Ground Improvement Techniques, Purushotham Raj, Laxmi Publications, New Delhi.
- 2. Ground Improvement Techniques, Nihar Ranjan Patro, Vikas Publishing House (p) limited , New Delhi.
- 3. An introduction to Soil Reinforcement and Geosynthetics, G. L. Siva Kumar Babu, Universities Press.

- 1. Ground Improvement, M.P.Moseley, Blackie Academic and Professional, USA
- 2. Designing with Geosynethetics, R. M Koerner, Prentice Hall
- 3. Engineering Principles of Ground Modification by Manfred R. Hausmann,McGraw-Hill Inc.,

Sem	V/VI/VII	L	Т	Р	С	COURSE CODE	
Regulation	V20	3	0	0	3	V20CEOE03	
Name of the	ENVIDONMENT					NTDAI	
Course		AL FUL		JIN AINI		NIKUL	
Branch	EXCEPT CE NG						

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

- Describe the air pollution and its control methods (K2)
- Explain industrial waste water and ways to control it (K3)
- Generalize the solid, hazardous waste and control methods (K2)
- Illustrate the importance of Environmental sanitation methods (K2)
- Illustrate the importance of Sustainable development (K3)

SYLLABUS

UNIT I

Air Pollution: Air pollution Control Methods–Particulate control devices – Methods of Controlling Gaseous Emissions – Air quality standards.Noise Pollution: Noise standards, Measurement and control methods

UNIT II

Industrial wastewater Management: Strategies for pollution control – Volume and Strength reduction-Recirculation of industrial waste water – Effluent standards.

UNIT III

Solid Waste Management: Solid waste characteristics –on-site handling and collection – separation and processing -Solid waste disposal method **Hazardous Waste:** Characterization – Nuclear waste – Biomedical wastes – Electronic wastes – Chemical wastes – Treatment and management of hazardous waste-Disposal methods.

UNIT IV

Environmental Sanitation: Environmental Sanitation Methods for Hostels and Hotels, Hospitals, Swimming pools and public bathing places, social gatherings (melas and fares), Schools and Institutions, Rural Sanitation-low cost waste disposal methods.

UNIT V

Sustainable Development: Definition- elements of sustainable developments-Indicators of sustainable development- Sustainability Strategies- sustainable development.

- 1. Environmental Engineering, by Ruth F. Weiner and Robin Matthews 4th Edition Elesevier, 2003.
- Environmental Science and Engineering by J.G. Henry and G.W. Heinke

 Pearson Education.
- 3. Environmental Engineering by Mackenzie L Davis & David A Cornwell. McGraw Hill Publishing.

- 1. Solid Waste Engineering, Vesilind, P.A., Worrell, W., Reinhart, D., Cenage learning, New Delhi, 2004
- 2. Hazardous Waste Management, Charles A. Wentz, McGraw Hill Publication, 1995.

Sem	V/VI/VII	L	Τ	Р	С	COURSE CODE
Regulation	V20	3	0	0	3	V20CEOE04
Name of the	DIIII DINC MAT			CONC	топ	TION
Course		ERIALS		CONS	ΙΚΟ	
Branch	EXCEPT CE					

After successful completion of the course, the student will be able to:

- Describe different building materials and their importance in building construction (K2)
- Relate various components of cement and lime (K3)
- Generalize the brick and stone masonry in construction (K2)
- Interpret different aggregates and their specifications (K2)
- Describe the importance of different building components (K2)

SYLLABUS

UNIT I

Stones, Bricks and Tiles: Building stones – classifications and quarrying – properties –structural requirements and dressing. Bricks – Composition of Brick earth – manufacture and structural requirements, Fly ash, Ceramics, Timber, Aluminum, Glass, Paints and Plastics: Wood - structure – types and properties– seasoning – defects; alternate materials for Timber–GI/ fibre – reinforced glass bricks, steel & aluminum, Plastics.

UNIT II

Cement & Admixtures: Ingredients of cement – manufacture – Chemical composition – Hydration - field & lab tests, Admixtures – mineral & chemical admixtures – uses, Various ingredients of lime – Constituents of lime stone – classification of lime – various methods of manufacture of lime

UNIT III

Mortars: Lime and Cement Mortars.

Masonry: Brick masonry – types – bonds; Stone masonry – types; Composite masonry – Brick- stone composite; Concrete, Reinforced brick. Cavity and partition walls, Finishing's, Plastering, Pointing, Painting, Claddings – Types – Tiles – ACP.

UNIT IV

Aggregates: Classification of aggregate – Coarse and fine aggregates- particle shape and texture – Bond and Strength of aggregate – Specific gravity – Bulk Density, porosity and absorption – Moisture content of Aggregate- Bulking of sand – Sieve analysis.

Miscellaneous materials: Bitumen and asphaltic materials, structural steel and other metals, geo textiles, carbon composites including properties and uses.

Building Components: Lintels, Arches, walls, vaults – stair cases – types of floors, types of roofs – flat, curved, trussed. Foundations – types; Damp Proof Course; Joinery – doors – windows – materials – types.

Form work: Types: Requirements – Standards – Scaffolding.

Text Books:

1. Building Materials and Construction – Arora & Bindra, Dhanpat Roy Publications. 2010,5th edition.

2. Building Materials, M. L. Gambhir, Tata McGraw Hill Publishing Co. Ltd. New Delhi. 2014,5th edition,.

3. Building Construction by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain – Laxmi Publications (P) ltd., New Delhi. 2016,11th edition.

4. Building Materials, S. S. Bhavikatti, Vikas publications House private ltd. 2012, 1st edition.

5. Building Construction, S. S. Bhavikatti, Vikas publications House private ltd. 2012, 1st edition.

6. Building planning and drawing,Dr.N.Kumara swamy,A.kameswara Rao, 2012, 6th edition.

References:

1. Building Materials and Construction by G C Sahu, Joygopal Jena McGraw hill Pvt Ltd 2017,1st edition.

- 2. Building Materials by Duggal, New Age International. 2012 ,4th edition.
- 3. Building Materials by P. C. Varghese, PHI. 2015, 2nd edition.
- 4. Building Construction by PC Varghese PHI. 2007, 1st edition.
- 5. Construction Technology Vol I & II by R. Chubby, Longman UK.1987, 2nd edition.
- 6. Alternate Building Materials and Technology, Jagadish, Venkatarama Reddy and others; New Age Publications.2017 ,2nd edition

Sem	V/VI/VII	L	Τ	Р	С	COURSE CODE		
Regulation	V20	3	0	0	3	V20CEOE05		
Name of the	REMOTE SENSING AND GEOGRAPHICAL							
Course	INFORMATION SYSTEM							
Branch	EXCEPT CE							

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

- Generalize the basic principles of Remote Sensing and GIS, including ground, air and satellite based sensor platforms (K2)
- Interpret the aerial photographs and satellite imageries (K2)
- Relate the process of data entry and preparation (K3)
- Examine the Spatial Data for a variety of applications (K3)
- Employ RS and GIS for diverse applications (K3)

SYLLABUS

UNIT I

Introduction to Remote Sensing: Basic concepts of remote sensing, electromagnetic radiation, electromagnetic spectrum, interaction with atmosphere, energy interaction with the earth surfaces, Characteristics of remote sensing systems.

Sensors and platforms: Introduction, types of sensors, airborne remote sensing, space borne remote sensing, image data characteristics, digital image data formats-band interleaved by pixel, band interleaved by line, band sequential, IRS, LANDSAT, SPOT, MODIS, ASTER,RISAT and CARTOSAT.

UNIT II

Image analysis: Introduction, elements of visual interpretations, digital image processing- image preprocessing, image enhancement, image classification, supervised classification, unsupervised classification.

UNIT III

Geographic Information System: Introduction, key components, application areas of GIS, map projections.

Data entry and preparation: spatial data input, raster data models, vector data models.

UNIT IV

Spatial data analysis: Introduction, overlay function-vector overlay operations, raster overlay operations, arithmetic operators, comparison and logical operators, conditional expressions, overlay using a decision table, network analysis-optimal path finding, network allocation, network tracing and buffer analysis.

RS and GIS Applications: Land cover and land use, agriculture, forestry, geology, geomorphology, urban applications.

Applications of Hydrology, Water Resources and Disaster Management: Food zoning and mapping, groundwater prospects and potential recharge zones, watershed management and disaster management with case studies.

Text Books:

- 1. "Remote sensing and GIS", Bhatta, B., Oxford University Press, 2008.
- 2. "Remote Sensing and Geographical Information Systems", Anji Reddy, M., B S Publications, 2008.
- 3. "Basics of Remote Sensing and GIS" Kumar. S., Laxmi Publications,

- 1. "Fundamentals of Remote Sensing", George Joseph, Universities Press, 2013.
- 2. "Concepts and Techniques of Geographical Information System", Chor Pang Lo and Yeung, A.K.W., Prentice Hall, India, 2006.
- 3. "Remote Sensing and its Applications", Narayan L.R.A, Universities Press, 2012.
- 4. "Introduction to Geographic Information Systems", Kand Tsung Chang, McGraw Hill Higher Education, 2009.
- 5. "Basics of Remote sensing & GIS", Kumar, S., Laxmi Publications, New Delhi, 2005.
- 6. "Principals of Geographical Information Systems", Burrough, P.A and McDonnell, R.A. Oxford University Press, 1998.
- 7. "Remote Sensing", Schowenger, R. A., Elsevier publishers, 2006.
- 8. "Remote Sensing and Image Interpretation", Lillesand, T.M, Kiefer, R.W. and Chipman, J.W., Wiley India Pvt. Ltd., New Delhi, 2013.
- 9. "Fundamentals of Geographic Information Systems", Demers, M.N, Wiley India Pvt. Ltd, 2013

Sem	V/VI/VII	L	Т	Р	С	COURSE CODE	
Regulation	V20	3	0	0	3	V20CEOE06	
Name of the	SOLID WASTE MANAGEMENT						
Course							
Branch	EXCEPT CE						

Upon successful completion of this course, the students will be able to

- Generalize Solid Waste and its management (K2)
- Assess different elements for managing Solid Waste (K3)
- Employ different methods for transportation and transformation of solid waste (K3)
- Organize different methods for processing and treatment of municipal solid waste (K3)
- Practice suitable disposal methods with respect to solid waste (K3)

SYLLABUS

UNIT I

Introduction to Solid Waste Management: Goals and objectives of solid waste management, Classification of Solid Waste – Factors Influencing generation of solid waste – sampling and characterization –Future changes in waste composition, major legislation, monitoring responsibilities.

UNIT II

Basic Elements In Solid Waste Management: Elements and their inter relationship – principles of solid waste management- onsite handling, storage and processing of solid waste Collection of Solid Waste: Types and methods of waste collection systems, analysis of collection system – optimization of collection routes.

UNIT III

Transportation and Transformation of Solid Waste: Need for transfer operation, compaction of solid waste – transport means and methods, transfer station types and design requirements.

Unit operations used for separation and transformation: shredding – materials separation and recovery, source reduction and waste minimization.

UNIT IV

Processing and Treatment: Processing of solid waste – Waste transformation through combustion and composting, anaerobic methods for materials recovery and treatment – Energy recovery – biogas generation and cleaning–Incinerators.

Disposal of Solid Waste: Methods of Disposal, Landfills: Site selection, design and operation, drainage and leachate collection systems –designated waste landfill remediation.

Text Books:

- 4. "Integrated Solid Waste Management", George Techobanoglous, McGraw Hill Publication, 1993
- 5. "Environmental Engineering", Gerard Kiely, McGraw Hill Publication, 2007
- 6. "Environmental Science and Engineering", J Glynn Henry, Gary W.Heinke, Prentice-Hall of India Pvt Ltd, 1996

References:

3. "Solid Waste Engineering", Vesilind, P.A., Worrell, W., Reinhart, D., Cenage learning, New Delhi, 2004

4. "Hazardous Waste Management", Charles A. Wentz., McGraw Hill Publication, 1995.

4. "Introduction to Environmental Engineering" Mackenzie L Davis, David A.Cornwell, McGraw Hill Publication, 2017

Sem	V/VI/VII	L	Т	Р	С	COURSE CODE
Regulation	V20	3	0	0	3	V20CEOE07
Name of the Course	DISASTER MANAGEMENT					
Branch	EXCEPT CE					

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

- Describe different natural hazards and disaster management (K2)
- Generalize the risk and vulnerability of disaster (K2)
- Illustrate the role of technology in disaster management (K3)
- Relate the importance of education and community preparedness to disaster recovery (K3)
- Organize the multi-sectional issues created by disaster (K2)

UNIT I

Natural Hazards and Disaster Management: Introduction of DM Disaster Management cycle – Five priorities for action- Case study methods of the following: floods, droughts – Earthquakes – global warming, cyclones & Tsunamis – Post Tsunami hazards along the Indian coast – landslides. Fire hazards – transport hazard dynamics – solid waste management – post disaster – bio terrotirism - rail and air craft's accidents-Management of these disasters

UNIT II

Risk and Vulnerability: – Building codes and land use planning – social vulnerability – environmental vulnerability -Financial management of disaster.

UNIT III

Role of Technology in Disaster Managements: Disaster management for infra structures, taxonomy of infra structure - mitigation programme for earth quakes –geospatial information in agriculture drought assessment-multimedia technology in disaster risk management and training-transformable indigenous knowledge in disaster reduction.

UNIT IV

Education and Community Preparedness: Education in disaster risk reduction-Essentials of school disaster education-Community capacity and disaster resilience-Community based disaster recovery -Community based disaster management and social capital-Designing resilience- building.

Multi-sectional Issues: Impact of disaster on poverty and deprivation-Climate change adaptation and human health -Exposure , health hazards and environmental risk-Forest management and disaster risk reduction - The Red cross and red crescent movement.

Text Books:

- 1. Disaster Management Global Challenges and Local Solutions' by Rajib shah & R R Krishnamurthy(2009),Universities press.
- 2. Disaster Science & Management' by Tushar Bhattacharya, Tata McGraw Hill Education Pvt. Ltd., New Delhi.
- 3. Disaster Management Future Challenges and Opportunities' by Jagbir Singh (2007), I K International Publishing House Pvt. Ltd.

Reference Books:

- 1. 'Disaster Management' edited by H K Gupta (2003), Universities press.
- 2. Natural Hazards and Disaster Management, Vulnerability and Mitigation by RB Singh
- 3. Disaster Management by Harish K.Gupta

Sem	V/VI/VII	L	Т	Р	С	COURSE CODE	
Regulation	V20	3	0	0	3	V20CEOE08	
Name of the	WATED OUALITY AND CONSEDUATION SYSTEMS						
Course	WATER QUALITY AND CONSERVATION SYSTEMS						
Branch	EXCEPT CE						

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

- Describe different parameters of Engineering Hydrology (K2)
- Relate different sources of surface and ground water (K3)
- Assess the importance of water supply systems and quality of water in reference to IS and WHO standards (K3)
- Develop different systems of plumbing (K3)
- Employ different conservation techniques (K3)

SYLLABUS

UNIT I

Introduction to Hydrology: Engineering hydrology, applications, Hydrologic cycle, evaporation, evapotranspiration, precipitation, run off, infiltration, hydrological data-sources

UNIT II

Sources of Water: Surface water, Lakes, Rivers, Reservoirs, comparison of sources with reference to quality, quantity and other considerations.

Groundwater, types of water bearing formations, springs, Wells and Infiltration galleries, Yields from infiltration galleries.

UNIT III

Importance of Protected Water: Supply systems, Flow chart of public water supply system, Water borne diseases, Estimation of water usages in different purpose.

Quality and Analysis of Water: Characteristics of water–Physical, Chemical and Biological-Analysis of Water – Physical, Chemical and Biological characteristics, Comparison of sources with reference to quality- I.S. Drinking water quality standards and WHO guidelines for drinking water.

UNIT IV

Plumbing Systems: Systems of plumbing-types of pipes and sanitary fittings and other accessories–one pipe and two pipe systems – Design parameters and factors.

UNIT V

Water conservation: importance and necessity, objectives, systems-rainwater harvesting, recharge pits, watershed.

1. Environmental Engineering – Howard S. Peavy, Donald R. Rowe, Teorge George Tchobanoglus – Mc-Graw-Hill Book Company, New Delhi, 1985 2. Elements of Environmental Engineering, K. N. Duggal, S. Chand & Company Ltd. New Delhi, 2012.

3. Water Supply and Sanitary Engineering – G. S. Birdie and J. S. Birdie

References:

1. Water Supply Engineering – P. N. Modi.

- 2. Water Supply Engineering B. C. Punmia
- 3. Water Supply and Sanitary Engineering G. S. Birdie and J. S. Birdie

Sem	VI Sem	L	Т	Р	С	COURSE CODE	
Regulation	V20	2	0	0	0	V20CEMC01	
Name of the	INTELLECTUAL	DDODEI	оту р	ICUTO	• с п.	АТЕМТС	
Course	INTELLECTUAL PROPERTY RIGHTS & PATENTS						
Branch	Common to All Branches						

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

- Describe the need of Intellectual Property Rights (K2)
- Generalize different issues regarding Copy Rights (K2)
- Employ the procedure for Patent registration and granting (K3)
- Discuss the importance of Trademark and its related issues (K2)
- Recognize the significance of Trade Secrets in Industry (K2)

SYLLABUS

UNIT I

Introduction to Intellectual Property Rights (IPR): Introduction to IPR, Evolutionary Past, Concept of IPR – Purpose of IPR, Types of IPR, WIPO - TRIPS, Nature of IPR, Patents, Trademarks, Copyrights, Neighboring Rights, Agencies responsible for IPR - Infringement, Use and Misuse of Intellectual Property Rights.

UNIT II

Copyrights: Introduction to Copyrights – Principles of Copyright Protection – Law Relating to Copyrights - Copyright Ownership – Transfer and Duration – Copyright Registration – Limitations – Infringement of Copyright – Relief and Remedy – Semiconductor Chip Protection Act.

UNIT III

Patents: Introduction to Patents - Laws Relating to Patents in India – Patent Requirements – Product Patent and Process Patent - Patent Registration and Granting of Patent -Exclusive Rights – Limitations - Ownership and Transfer – – Revocation of Patent – Patent Appellate Board - Infringement of Patent – Compulsory Licensing – Software Protection and Computer related Innovations.

UNIT IV

Trademarks: Introduction to Trademarks – Laws Relating to Trademarks – Functions of Trademark – – Trade Mark Registration – Trade Mark Maintenance – Transfer of rights – Deceptive Similarities - Likelihood of Confusion - Dilution of Ownership – Trademarks Claims and Infringement – Remedies – Passing Off Action.

Trade Secrets: Introduction to Trade Secrets – General Principles - Laws Relating to Trade Secrets - Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreements – Breach of Contract –Law of Unfair Competition – Trade Secret Litigation – Applying State Law, Cyber Law and Cyber Crime

Text Books:

- Intellectual Property Rights (Patents & Cyber Law), Dr. A. Srinivas.
 Oxford University Press, New Delhi.
- PrabhuddhaGanguli: Intellectual Property Rights, Tata Mc-Graw Hill, New Delhi
- 3. R.Radha Krishnan, S.Balasubramanian: Intellectual Property Rights, Excel Books. New Delhi.

- 1. Deborah E.Bouchoux: Intellectual Property, Cengage Learning, New Delhi.
- 2. Richard Stim: Intellectual Property, Cengage Learning, New Delhi.
- 3. Kompal Bansal &Parishit Bansal Fundamentals of IPR for Engineers, B. S. Publications (Press).
- 4. Cyber Law Texts & Cases, South-Western's Special Topics Collections.
- 5. M.Ashok Kumar and MohdIqbal Ali: Intellectual Property Rights, Serials Pub.

Sem	VI Sem	L	Т	Р	С	COURSE CODE
Regulation	V20	2	0	0	0	V20CEMC02
Name of the Course	PROFESSIONAL ETHICS AND HUMAN VALUES					
Branch	Common to All Branches					

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

- Discuss the importance of human values and their context (K2)
- Generalize the professional ethics and norms of engineering practice (K2)
- Review the contextual knowledge of engineering as social experimentation (K2)
- Identify the engineer's responsibility for Safety & Risks (K2)
- Clarify the professional rights & responsibilities at global level (K2)

UNIT I

Human Values: Morals, Values and Ethics – Integrity – Work Ethics – Service Learning –Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing –Honesty –Courage – Value time – Co-operation – Commitment – Empathy –Self-confidence–Spirituality-Character.

UNIT II

Engineering Ethics: The History of Ethics, Purposes for Engineering Ethics, Consensus and Controversy, Professional and Professionalism, Professional Roles to be played by an Engineer –Self Interest, Customs and Religion, Uses of Ethical Theories, Professional Ethics, Types of Inquiry in Engineering Ethics.

UNIT III

Engineering as Social Experimentation: Comparison with Standard Experiments –now ledge gained–Conscientiousness–Relevant Information–Learning from the Past–Engineers as Managers, Consultants, and Leaders – Accountability – Role of Codes– odes and Experimental Nature of Engineering. **UNIT IV**

Engineers' Responsibility for Safety and Risk: Safety and Risk, Concept of Safety – Types of Risks – Voluntary v/s Involuntary Risk- Short term v/s long term Consequences, Delayed v/s Immediate Risk- Safety and the Engineer – Designing for Safety – Risk-Benefit Analysis-Accidents.

UNIT V

Engineers' Responsibilities, Rights & Global Issues: Collegiality, Senses of Loyalty, professionalism and Loyalty, Professional Rights & Responsibilities– confidential and proprietary information, Bribes/Gifts, Whistle Blowing. Globalization- Cross-culture Issues, Environmental Ethics, Computer Ethics, Weapons Development Ethics and Research Ethics, Intellectual Property Rights.

- 1. "Engineering Ethics and Human Values" by M. Govindarajan, S.Natarajan and V.S.Senthil Kumar-PHILearningPvt.Ltd-2009.
- 2. "Professional Ethics and Morals" by Prof.A.R.Aryasri, Dharanikota Suyodhana-Maruthi Publications.
- 3. "Professional Ethics and Human Values" by A.Alavudeen, R.Kalil Rahman and M.Jayakumaran-Laxmi Publications.

- 1. "Professional Ethics and Human Values"by Prof.D.R.Kiran.
- 2. "Indian Culture,Values and Professional Ethics"by PSRMurthy-BS Publication.
- 3. "Ethics in Engineering" by Mike W.Martin and Roland Schinzinger–TMH.