Programme: B. Tech. (Civil) – Sem V - 2014 Course

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme-Marks							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW & Oral	TW & Practical	Total	Theory	TW	Total
31.	Structural Design-I*	4	2	1	60	20	10	10	50	--	150	5	1	6
32.	Advanced Surveying	3	2	--	60	20	10	10	50	--	150	3	1	4
33.	Engineering Project Management	3	2	--	60	20	10	10	50	---	150	3	1	4
34.	Structural Analysis-II	3	--	-	60	20	10	10	---	---	100	3	--	3
35.	Advanced Mechanics of Fluid	3	2	--	60	20	10	10	50	----	150	3	1	4
36.	Professional Skill Development-V	4	--	--	100	--	--	--	--	---	100	4	--	4
	Total	**20**	**08**	**1**	**400**	**100**	**50**	**50**	**200**	**--**	**800**	**21**	**4**	**25**

*End Sem Exam of duration 4 hours.

Optional Subject

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme-Marks							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW & Oral	TW & Practical	Total	Theory	TW	Total
	Engineering Mathematics IV	4	--	--	60	20	10	10	--	--	100	4	--	4

Programme: B. Tech. (Civil) – Sem VI - 2014 Course

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme-Marks							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW & Oral	TW & Practical	Total	Theory	TW	Total
37.	Structural Design-II*	3	2	1	60	20	10	10	50	--	150	4	1	5
38.	Environmental Engineering-I	3	2	--	60	20	10	10	--	50	150	3	1	4
39.	Estimation, Costing and Valuation*	3	2	1	60	20	10	10	50	---	150	4	1	5
40.	Geotechnical Engineering	3	2	--	60	20	10	10	50	---	150	3	1	4
41.	Elective-I	3	--	--	60	20	10	10	--	----	100	3	--	3
42.	Professional Skill Development-VI	4	-	--	100	--	--	--	--	---	100	4	-	4
	Total	**19**	**08**	**2**	**400**	**100**	**50**	**50**	**150**	**50**	**800**	**21**	**4**	**25**

*End Sem Exam of duration 4 hours.

Total Credits

Semester V = 25

Semester VI = 25

Grand Total = 50

31 Structural Design-I*

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 4 Hours / Week	End Semester Examination: 60 Marks	Theory :5
Practical: 2 Hours / Week	Continuous Assessment: 40 Marks	
Tutorial : 1 Hours / Week	Term Work & Oral : 50 Marks	Termwork: 1

Course Pre-requisites:

The Students should have knowledge of

1.	Structural Analysis- I
2.	Mechanics of Solids

Course Objectives:

	To make student capable to design different structural elements using steel.

Course Outcomes:

The student will be able to

1.	estimate design load
2.	design a connection for axial load
3.	design a members for axial tension
4.	design a members for axial compression
5.	design a built up column
6.	design a beam

UNIT - I	**Design Philosophy**	**(06 Hours)**

	Types of structural elements and their behavior, Introduction to IS:875, Types of Loads, Estimation of Loads, Wind Load on Roof Truss. Load combinations, Design Load, Steel as a structural material, Type of structural steel, Mechanical Properties, Rolled steel sections and engineering properties, Introduction to SP6(1), Strength of Section, Design strength, Partial safety factors, Concept of Limit state design, Introduction to IS:800.	
UNIT - II	**Design of Connections for Axial Load**	**(06 Hours)**
	Types of fasteners, advantages and disadvantages, Types of bolts, Design strength of bolts, Design of bolted connection and detailing, Strength of weld, Design of weld and detailing.	
UNIT - III	**Design of Axially Loaded Tension Members**	**(06 Hours)**
	Behavior of member in tension, Axial tension capacity of plates, single and double angles and channel section, Design of axially loaded Tension members.	
UNIT - IV	**Design of Axially Loaded Compression Members**	**(06 Hours)**
	Behavior of member in compression, Concept of Effective Lengths, Axial compression capacity of single and double angle section, Design of axially loaded compression members	
UNIT - V	**Design of Built up Column and Column Base.**	**(06 Hours)**
	Axial compression capacity of Built up Column, Design of built up column, Design of Lacing system, Design of battening system, Design of slab base, Design of gusseted base.	
UNIT - VI	**Design of Beams**	**(06 Hours)**
	Behavior of beams, Shear and moment capacity of Laterally supported and laterally unsupported beam. Design of beam, Design of built up section, Curtailment of plates, Design of bolted connections for shear and moment.	
Term Work: The term work shall consist of minimum any ONE projects with 2 numbers of half imperial sheets based on following topics:		

1) Design of roof truss: Load estimation, Analysis of truss, Design force for member, Design of Members, Design of connection, Design of Purlin, Drawing.
2) Design of Building: Load estimation, Analysis of frame, Design of Secondary beams, main beams, Columns, Beam to Beam, Beam to Column connections, column bases, etc.
Assignments:
1) Calculation of Wind load acting on the roof truss.
2) Design of bolted or welded connection for axial load.
3) Design of member for axial tensile load.
4) Calculate axial capacity of member in compression.
5) Design of lacing or battening connection for built up column
6) Calculation of moment and shear capacity of rolled / built up section.
Reference Books:
1) N. Subhramanian, " Design of Steel Structures", Oxford University Press
2) S. K Duggal, "Limit State Desin of Steel Structures", Tata McGraw-Hill Education
3) S.S.Bhavikatti, "Design of Steel Structures: By Limit State Method", I K International Pub
4) Dr. Ramchandra, "Limit State Design of Steel Structures", Scientific Publishers
5) M. R. Shiyekar, "Limit State Design in Structural Steel", Prentice-Hall of India
6) IS:800-2007, General Construction in Steel - Code of Practice"
7) IS:875-1987, "Code of Practice for Design Loads for Buildings and Structures Part (1 to 5)"
8) IS:808-1989, "Dimensions for Hot Rolled Steel Beam, Column, Channel and Angle Sections"
9) SP-6(6)- 1972, "Handbook for Structural Engineers"

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

32: ADVANCED SURVEYING

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 3
Practical: 2 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work & Oral: 50 Marks	Termwork:1

Course Pre-requisites:

The Students should have knowledge of

1.	Fundamentals of Civil Engineering
2.	Surveying

Course Objectives:

	To make student capable to use advanced surveying techniques for mapping

Course Outcomes:

The student will be able to

1.	explain Geodetic control survey and theory of errors.
2.	explain various features of modern Total Station for survey .
3.	describe principles and components of Space Based Positioning System and its applications .
4.	describe technique of Hydrographic Survey.
5.	explain basics of Remote sensing and Geographical information System and its applications
6.	describe the process of Aerial survey and its use in Surveying.

UNIT - I	**Geodetic Control Survey:**	**(6 Hours)**

	Introduction to geodetic control survey, System- Triangulation and Trilateration, Triangulation stations and figures, concept of base line. Types of errors, Probable error and its determination, Laws of weights, Method of least squares, Normal equation, Adjustment of triangulation figure.	
UNIT - II	**Total Station Survey:**	**(6 Hours)**
	Concept and necessity of an electronic total station instrument. Types of total station as per EDM , range and angle resolution system. Principle features of an ETS, temporary adjustments, On board programmes such as REM, RDM, Free stationing, resectioning etc. ,traverse survey with ETS. Concept of data down loading and post processing software, Errors in ETS survey.	
UNIT - III	**Space Based Positioning Techniques:**	**(6 Hours)**
	Introduction and concept, segments of SBPS- space, control and user. GNSS type SBPS in action-GPS, GLONASS, Compass. RNSS type SBPS in action-Quasi zenith, IRNSS. GPS signals, GPS receivers-navigation and surveying. SBPS positioning systems-absolute and differential. Access denial techniques and ephimeris. SBPS coordinates and heights. Surveying with SBPS. Errors in positioning with SBPS. Applications of SBPS	
UNIT - IV	**Hydrographic Survey**	**(6 Hours)**
	Concept, objects, Soundings and instruments and personnel required for sounding, methods of locating soundings. Three point problem and its solution by mechanical, analytical and graphical method. Tides and tidal gauges and establishment of MSL	
UNIT - V	**Photogrammetry**	**(6 Hours)**
	Elements of photogrammetry, types of photogrammetry. Aerial photographs their types and scale. Concept of relief displacement, Stereoscopy, parallax and mirror stereoscope, parallax equation and difference in elevation from differential parallax. Ground control. Procedure of aerial survey and flight planning.	
UNIT - VI	**Remote Sensing and Geographic Information System :**	**(6 Hours)**
	Remote sensing-concept, types –active and passive, components of remote sensing system, electromagnetic energy and spectrum,	

	atmospheric windows and spectral signature. Remote sensing platforms and sensors. Remote sensing data products, interpretation of remotely sensed images visual and digital. Limitations and applications of remote sensing. Concept and need of GIS, Components- people, procedure, hardware, software and data .Functions- Input, manipulation, management, Query analysis and Visualization. Application and limitations of GIS.	

Assignments:

1. Solution of problems on Laws of weights and normal equations.
2. Collection of information for various types of ETS used and available in the market and their salient features
3. Collection of information of SBPS of various countries and applications of SBPS.
4. Wrte a report on Instruments used for measurement of soundings.
5. Case studies on applications of Remote sensing and GIS.
6. Case studies on applications of Aerial survey.

Term Work: Any Ten Experiments

1 .Study and use of one second theodolite and measurement of horizontal angle

2. Measurement of horizontal angles by reiteration method and Measurement of vertical angle.

3. Study and use of total station.

4. Study and use of total station for traverse survey.

5. Applications of Total Station for REM, RDM.

6.Study and Use of Nautical Sextant for measurement of horizontal angles.

7. Study and Use of Mirror stereoscope to find air base distance. parallax bar and determination of difference in elevation by differential parallax

8. Study and use of parallax bar and determination of difference in elevation by differential parallax.

9. Adjustment of braced Geodetic quadrilateral
10. Study and use of Handheld GPS for traverse survey
11. Solution of three point problem in hydrographic surveying
12. Study of GIS software.
Text Books:
1.Duggal S. K., "Surveying Vol-1, Vol-2", Tata Mac Graw Hill pub. co., New Delhi
2.Punmia B. C., "Higher Surveying", Laxmi Publications, New Delhi
3. Chandra A.M. ,"Higher Surveying " ,New Age International Publishers,
4. Bannister A. and Raymond Baker , "Surveying" , Pearson Education
5 Anji M. Reddy, " Text book of Remote Sensing and GIS ", BSP BS Publications
Reference Books:
1.Uren J., W. F. Price, "Surveying for Engineers", Macmillan Pub
2.Wolf P. R., "Elements of Photogrammety", Mc Graw Hill
3.Agarwal C. S., Garg P. K., "Remote Sensing in Natural Resources", Wheeler Publishing
4. Lo C.P., Albert Yeung , " Concepts and techniques of GIS ", Printice Hall of India

Syllabus for Unit Test:	
Unit Test -1	UNIT – I,II,III
Unit Test -2	UNIT – IV, V ,VI

33: Engineering Project Management

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory -3
Practical: 2 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work & oral: 50 Marks	Termwork -1

Course Pre-requisites:

The Students should have knowledge of

1.	Building construction.
2.	Building planning and design.

Course Objectives:

	To prepare the student to analyze the network and monitor and control the civil engineering projects.

Course Outcomes:

The student will be able to

1.	prepare organization chart.
2.	prepare a network and analyze by CPM and PERT methods.
3.	update network and carryout resource allocation
4.	carry out material management
5.	solve linear programming problem by graphical and simplex methods
6.	check quality parameters in construction process.

UNIT - I	**Introduction to Project Management**	**(06 Hours)**
	Importance, Objectives and functions of Management, Categories of Project, Project Life Cycle Concept, Importance of organizational	

	structures, types of organization, Project Manager education, experience, authority & responsibility.	
UNIT - II	**Project Planning & Scheduling**	**(6 Hours)**
	Gantt /Bar Charts and its limitations, Network planning, network analysis, C.P.M., P.E.R.T., Types of floats, Slack. Ladder network ,	
UNIT - III	**Project Monitoring & Control**	**(6 Hours)**
	Resource allocation, resource smoothening and leveling, crashing of network, direct cost and indirect cost, cost slope, updating of network,	
UNIT - IV	**Material Management**	**(6 Hours)**
	Objectives of material management, material requirement, scheduling, monitoring, inventory control, inventory classification, inventory management, economic order quantity, inventory models, ABC analysis	
UNIT - V	**Linear Programming**	**(6 Hours)**
	Identification & formulation of L.P. problem, requirements and assumptions of linear programming model, graphical method and simplex method	
UNIT - VI	**Total Quality Management**	**(6 Hours)**
	Importance of total quality management in construction process and steps involved, concept of quality control, quality assurance, quality management and TQM, study of various quality standards in construction, six sigma concept, designing of quality manual, checklist and inspection reports, necessity of MIS in management	

Assignments -:

1) Project Manager Education, experience, authority & responsibility.
2) Draw a bar chart for a building project.
3) Ladder network analysis.
4) ABC analysis of small building project.
5) Problems on linear programming, graphical and simplex method.
6) Total quality management.

Term Work :	
1.	Assignment on different types of organization and their flowcharts.
2.	Assignment on bar chart.
3.	Assignments on C.P.M. and P.E.R.T.`
4.	Assignment on resource leveling.
5.	Assignment on crashing of network.
6.	Assignment on updating of network.
7.	Assignment on ABC and EOQ analysis.
8.	Assignment on linear programming, graphical and simplex method.
9.	Study of quality control system of a construction project.
10.	Prepare a network for any construction project containing minimum 25 activities and find out total float and free float.
Text Books:	
1.	Construction Engineering and Management by S. Seetharaman, Umesh Publications, New Delhi.
2.	PERT & CPM principles & applications by L.S. Srinath, affiliated East West press Pvt. Ltd., New Delhi.
3.	Project Planning & control with PERT & CPM by Dr. B.C. Punmia, K.K. Khandelwal, Laxmi Publications (P) Ltd, New Delhi.
Reference Books:	
1.	Construction Management and Planning by B. Sengupta and H. Guha, Tata McGraw Hill Publishing Company, New Delhi.
2.	Construction Project Management Planning, Scheduling and controlling by K.K. Chitkara TMH Publishing Company, New Delhi
3.	Inventory Control by L.C. Zhamb, Everest Publishing House
4.	Project Management by Khatua, Oxford University Press
5.	Project Planning, Analysis selection, Implementation & Review by Prasanna Chandra, Tata McGraw Hill, New Delhi
6.	Civil Engineering Project Management by Alan C. Twort & J. Gordon Rees, Elsevier
Syllabus for Unit Test:	
Unit Test -1	**UNIT – I, II & III**
Unit Test -2	**UNIT – IV, V & VI**

34 Structural Analysis-II

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory : 3
	Continuous Assessment: 40 Marks	

Course Pre-requisites:

The Students should have knowledge of

1.	Structural Analysis- I
2.	Mechanics of Solids

Course Objectives:

	The student should able to analyse the structure.

Course Outcomes:

The student should be able to

1.	calculate plastic moment capacity of section.
2.	draw Influence Line Diagrams (ILD) for reaction, Shear Force and Bending Moment
3.	draw Influence Line Diagrams (ILD) for force in members of truss
4.	analyse three hinge arch
5.	analyse two hinge arch
6.	analyse frame using approximate method.

UNIT - I	**Plastic Analysis of Structure**	**(06 Hours)**

	Elastic and Plastic moment capacity, Plastic hinge, Shape factor, Collapse mechanism, Applications to continuous beams, Fixed beams, Single bay single storied rectangular frames.	
UNIT - II	**Influence Line Diagrams and rolling loads for beams:**	**(06 Hours)**
	Basic Concept of Influence lines, Construction of Influence Line Diagrams (ILD) for Support reactions, Shear Force and Bending Moment at a given section for simply supported beams, overhanging beams and compound beams. Muller-Breslau's principle and its application to above beams. Rolling loads - Use of influence line diagram for determination of SF and BM in beams due to UDL shorter than span, UDL longer than span, Series of concentrated loads. Conditions for maximum SF and maximum BM values.	
UNIT - III	**Influence Line Diagrams and rolling loads for truss:**	**(06 Hours)**
	Influence line diagram for axial forces in members of plane determinate trusses. Use of influence line diagram for determination of member forces of plane determinate trusses under dead load and live load.	
UNIT - IV	**Analysis of Three Hinged Arch**	**(06 Hours)**
	Concept and types of arches, Three hinged arches – analysis, Calculation of horizontal Thrust, Radial Shear, Normal Thrust and BM at a cross section.	
UNIT - V	**Analysis of Two Hinged Arch**	**(06 Hours)**
	Two hinged arches – Horizontal Thrust at support, Radial Shear, Normal Thrust and BM at a cross section. BM diagram for concentrated load and UDL.	
UNIT - VI	**Approximate Methods of the Analysis:**	**(06 Hours)**
	Approximate methods of analysis of multistoried, multibay, 2-D rigid jointed frames by i) Portal method ii) Cantilever method iii) Substitute Frame Method	

Assignments:	
1) Calculate Plastic moment capacity of the cross section	
2) Draw ILD for beams for reaction, SF and BM	
3) Draw ILDs for members of the Truss	
4) Analyse three hinged arch	
5) Calculate support reactions for two hinged arch.	
6) Analyse frame using any approximate method	
Reference Books:	
1) Hibbeler R. C., "Structural Analysis", Prentice Hall Publication	
2) Pandit G. S. & Gupta S. P., "Theory of Structures- Vol-II", Tata McGraw Hill Publication	
3) Timoshenko S. P. & Young, "Theory of Structures", McGraw Hill Publication	
4) Junnarkar S. B. & Adavi, "Mechanic of Structures", Charotar Publishing House	
5) Ramamrutham S. & Narayan R., "Theory of Structures", Dhanpat Rai Publishing Company	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

35 Advanced Mechanics of Fluids

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory : 3
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work & Oral : 50 Marks	Termwork : 01

Course Pre-requisites:

The Students should have knowledge of

1.	Fluid Mechanics basics, Types of flows, friction.
2.	Basic knowledge of Water retaining structure like dam, weir etc. irrigation channel.
3.	Basic knowledge of Drag & lift, unsteady flow.
4.	Basic knowledge of Hydro power plant.
5.	Basic knowledge of pumps.

Course Objectives:

	To impart knowledge of open channel flows and hydraulic machinery to students.

Course Outcomes:

The student will be able to

1.	Design most efficient channel section, find critical depth of a flow.
2.	Understand and apply knowledge of various flow profile and their characteristics.
3.	Find energy dissipated in a hydraulic jump.

4.	Calculate forces on vanes for different conditions.	
5.	Understand and apply knowledge of turbines.	
6.	Understand and apply knowledge of pumps.	
UNIT - I	**Uniform Flow in Open Channels:**	**(06 Hours)**
	Basic Equations: Continuity Equation, Bernoulli's Equation, & Momentum Equation as applied to open channel one dimensional flow, Velocity distribution in open channel, Chezy's & Manning's formulae, factors affecting Manning's roughness coefficient, Normal depth, Conveyance Section factor, Most efficient channel section, Specific Energy, Specific Energy diagram, Depth-Discharge diagrams, alternate depths, Critical depth, Critical slopes, Froude number, Specific Force, Specific force diagrams, Conjugate depths, Depth-Discharge diagrams with respect to specific force.	
UNIT - II	**Gradually Varied Flow in Open Channels:**	**(06 Hours)**
	Gradually and rapidly varied flows, their examples, Basic assumptions in the derivation of GVF, Differential equations of GVF, Various GVF profiles, and their characteristics.	
UNIT - III	**Rapidly Varied Flow:**	**(06 Hours)**
	Hydraulic Jump in Rectangular and Trapezoidal channels, Classification & Practical uses of Jump, Examples of occurrence of Hydraulic Jump, Conjugate Depths, Energy Dissipation in Hydraulic Jump, Location of Jump, Devices for measurement of velocity and discharge in open Channels, Stream gauging.	
UNIT - IV	**Unsteady Flow:**	**(06 Hours)**
	Types, Flow through openings under varying head, Flow Compressibility, Celerity of Elastic Pressure Waves, Water Hammer Phenomenon, Rigid & Elastic water Columns Theories, Simple cases neglecting Friction, rapid	

	acceleration of flow due to sudden opening of valve, surge tanks and their functions, Location and Classification.	
UNIT - V	**Fluid Flow Around Submerged Bodies:**	**(06 Hours)**
	Fluid Flow Around Submerged Bodies: Practical problems involving fluid flow around submerged bodies, Definition & Expression for Drag, lift, drag coefficient, Types of Drag.	
UNIT - VI	**Hydraulic Machines :**	**(06 Hours)**
	Impact of Jet: Force Exerted due to impact of jet on stationary and moving flat and curved plates using linear momentum Principle, Principle of angular momentum, Euler's Momentum Equation for Turbines. Element of Hydropower plant, Hydraulic turbines, Heads & efficiencies, Governing of turbines, Cavitation in turbines, Performance of turbines, Prediction of performance in terms of unit quantities and specific quantities, specific speed. Theory of centrifugal pump, Centrifugal head due to rotation, Heads & efficiencies, Cavitation, Prediction of performance in terms of specific quantities, specific speed, characteristic curves.	

Assignments (Any Six)

1. Solve Four Numericals to find out Critical Depth.
2. Solve Numerical on GVF to find out flow profiles
3. Solve Numericals on Hydraulic Jump to find out dissipation of energy.
4. Solve Numericals to find out forces on different types of vanes.
5. Solve Numericals on design of Turbines.
6. Solve Numericals on design of Pumps.
7. Collection & Study of Information Brochure about different Hydraulic Machineries.
8. Collection & Study of Information Brochure about Hydraulic Lab Supply Companies.

Term Work: (Any Eight)	
1. Flow around aerofoil.	
2. Flow around a Circular Cylinder.	
3. Impact of jet around flat / curved plate.	
4. Performance Curves of Hydraulic Turbine. Constant Head Characteristic Curve	
5. Characteristics of Centrifugal Pump.	
6. Uniform flow formulae of open channel.	
7. Velocity distribution in open channel flow.	
8. Hydraulic jump as energy dissipater.	
9. Characteristics of various GVF profiles.	
10. Design of Hydraulic Centrifugal Pump.	
11. Design of Hydraulic Turbine.	
12. GVF Computations by Direct Step Method.	
Text Books:	
1. Garde R. J., Mirajgaonkar A. G., "Engineering Fluid Mechanics", Scitech Publication, Chennai	
2. Rangaraju K. G., "Open Channel Flow", Tata McGraw Publication	
3. Streeter Wylie, "Fluid Mechanics", Tata McGraw Publication	
4. Subramanyam K., "Open Channel Flow", Tata McGraw Publication	
5. Ven Te Chow, "Open Channel Hydraulics", Tata McGraw Publication	
6. Zoeb Husain, Zanial Alimuddin , " Basic Fluid Mechanics and Hydraulic Machines" BSP Books Pvt. Ltd. Hyderabad	
Reference Books:	
7. Fox, McDonald, Pritchard, "Fluid Mechanics SI Version" Willey Student Edition	
8. Frank M. White, "Fluid Mechanics", McGraw Hills Series	
9. C P Konthadraman, R Roodramoorthy, "Fluid Mechanics &Machinery" New Academic Science	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I,II,III
Unit Test -2	UNIT – IV, V, VI

36: Professional Skills Development V

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTED:**
Theory: 4 Hours / Week	End Semester Examination: 100 Marks	4

Course Pre-requisites

The Students should have knowledge of

1.	Basic concepts of Maths, Logical reasoning and English Grammar taught in the last semester.
2.	An overall idea about vocabulary, Public speaking skills taught in the last semester
3.	Knowledge of writing skills, importance of professionalism in emails and letters.
4.	Knowledge on handling criticism and the concept of conflicts.
5.	Awareness of the interpersonal skills like team work and its importance in the corporate sector.

Course Objectives

	The Professional Skills Development 5 is an extension of PSD- 4 with focus on the remaining topics of Aptitude, Reasoning and Grammar. The further complex concepts of Aptitude and Grammar aims to acquaint them with the topics and also provide them techniques to solve the question with tricks/methods in a very short period. The English communication and soft skills section of PSD-5 focuses on the higher aspects of soft skills training students on how to handle Group Discussions during placement process and other topics such as grooming them on how to handle conflicts effectively in the corporate scenario and also the correct attitude/approach to solve problems collectively from a team's perspective and also individually.

Course Outcomes

The student should be able to

1.	Learn further concepts of Maths, Logical reasoning and English grammar and apply short cuts/ tricks to solve questions in less time. Learn remaining 25-30 rules of grammar topics of tenses and Sub- verb agreement relevant from the recruitment point of view.

2.	Use Mnemonics, and learn appropriate strategies to handle complex topics in GDs and ways to handle them. Students would learn the appropriate ways of stating opinions, disagreeing or communicating during the Group Discussion Process.	
3.	Apply various strategies of conflict resolution through amicable way to settle team conflicts/disputes. They would learn to handle criticism and feedback in a positive way as an individual as well as a team.	
5.	Students would learn effective time management strategies- Pareto principle (the 80-20 rule of time management) and apply them in the corporate life. It would be a continuation of the topic covered during the previous semester PSD-4	
6.	Learn to handle Case studies effectively and incorporate the right approach towards Case Studies asked during the recruitment process.	
Unit I	**Aptitude (Maths, Logical Reasoning, English)**	**(24Hours)**
	• Maths ▪ Time, Speed & Distance ▪ Time & Work ▪ Simple Interest & Compound Interest in continuation ▪ Maths Revision • Logical Reasoning ▪ Data Interpretation ▪ Data Sufficiency ▪ Set Theory & Syllogisms ▪ Reasoning Revision • English ▪ Grammar – II – (Adjective, Verb, Sub- Verb Agreement) ▪ Grammar- (Tenses) ▪ Vocabulary ▪ Verbal Ability- Revision	
Unit II	**Soft Skills & English Communication**	**(24Hours)**
		(6 Hours)
	• Situational Conversation • Situational Writing • GD Orientation • Mock GD-1 • Mock GD-2 • Mock GD-3	

	• Conflict Resolution • Problem Solving Skills • Time- Management Skills • Handling Case Studies • Management Games • Business Meeting Etiquettes	
Text Books		
1. APAART: Verbal Ability		
2. APAART: Logical Reasoning		
3. APAART: Quantitative Aptitude		
4. APAART: Speak Well 1 (English Language and Communication)		
5. APAART: Speak Well 2 (Soft Skills)		

37 Structural Design-II

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 4
Practical: 2 Hours / Week	Continuous Assessment: 40 Marks	
Tutorial: 1 Hour/Week	Term Work: 25 Marks	Termwork:1

Course Pre-requisites:

The Students should have knowledge of

1.	conditions of equilibrium, plotting Shear force and bending moment diagram of beams with various support conditions and various load combinations.
2.	Determination of bending stress and shear stress in beams.
3.	Concept of short, long columns, direct and bending stress, principal stress and strains.
4.	Concrete, concreting techniques and properties of concrete.
5.	Plastic theory, concepts of planning of staircase, planning of a building.

Course Objectives:

	The student should be able to complete the design and detailing of a G+2 storied R.C.C. building.

Course Outcomes:

The student will be able to

1.	differentiate between various design philosophies of R.C.C. and know the properties of materials used in R.C.C. and the partial safety factors in Limit State Method .
2.	differentiate between under-reinforced, over-reinforced and balanced section , analyse and design a singly reinforced, doubly reinforced and flanged beam by Limit State Method.
3.	design beams for flexure, shear, bond for various supporting conditions

4.	design different types of slabs and a staircase.	
5.	design short columns for axial load, uniaxial and biaxial bending by using SP-16.	
6.	design isolated column footings.	
UNIT - I	**Materials and Design Approach:**	**(6 Hours)**
	Introduction of R.C.C: Materials: Types of reinforcements, Study of properties of concrete and properties of steel. Introduction to design philosophies of R.C. Structures: Working Stress Method, Ultimate Load method, Limit State Method. Various limit states, semi-probabilistic approach, partial safety factors for materials and loads, various structural elements and loads on the elements, Load combinations.	
UNIT - II	**R.C. Sections in Flexure:**	**(6 Hours)**
	R.C. Sections in Flexure: Limit State Method: Assumptions, Strain variation diagram, Stress variation diagram; Concept of under reinforced, balanced, over reinforced section; Design parameters of a singly reinforced rectangular section, Moment of resistance of singly reinforced, doubly reinforced, rectangular, flanged section.	
UNIT – III	**Beams:**	**(6 Hours)**
	Design of Beams for Flexure, Shear, Bond : Behaviour of R.C .beam in shear, Shear failure, Shear strength of beam Without shear reinforcement, Design of shear reinforcement. Bond –Introduction, types of bonds, Code provision. Design of beams- Simply supported, cantilever, Continuous – Singly reinforced, doubly reinforced and flanged beam. Introduction to Redistribution of moments in beams: Assumption, Requirements of I.S.456-2000. Various load combinations in continuous beams.	
UNIT – IV	**Slabs:**	**(6 Hours)**
	Design of Slabs: One Way Slabs: Simply Supported, Cantilever, Continuous	

	Two Way Slabs: Various support conditions Design of Staircase: Dog legged, Open well	
UNIT – V	**Columns:**	**(6 Hours)**
	Design of Columns: Columns- Axially loaded short columns, requirements of minimum eccentricity; Design of short columns for axial load, uniaxial, biaxial bending (use of SP 16); Checking safety of column for biaxial bending	
UNIT-VI	**Footings:**	**(6Hours)**
	Design of Footings: Footings- Design of isolated column footing for axial load, uniaxial Bending.	

Term Work:

1. Design of G+2 storied building for gravity loads only. The design should include all types of slabs, beams, columns, footings and staircase (two flights) (Maximum three students in a group)

2. Report of a site visit related to building structure under construction.

3. Four half imperial drawing sheets .

Assignments : Any Six

1.Assignment based on various methods of design.

2.Assignment based on basic parameters in design-Limit State Method and Working Stress Method.

3. Assignment based on moment of resistance of a singly reinforced beam, doubly reinforced beam, flanged beam.

4. Assignment based on design of various types of slabs.

5. Assignment based on design of various types of beams.

6. Assignment based on staircase design.

7. Assignment based on design of various types of columns.

8. Assignment based on design of isolated footing.

9. Making the models of reinforcement in various types of slabs. 10. Making the models of reinforcement in various types of beams. 11. Making the models of reinforcement in columns. 12. Making the models of reinforcement in staircase. 13. Making the models of reinforcement in footing.
Text Books:
1.Dr. V. L. Shah and Dr. S. R. Karve- "Limit State Theory and Design", Pune Vidyarthi Griha Publications
2. Punmia, Jain and Jain, "Comprehensive Design of R. C. Structures", Standard Book House
3. S. S. Bhavikatti, "Design of R.C.C. structural elements", New Age International Ltd.
4. P. Dayaratnam, "Limit State Analysis and Design", Wheeler Publishing Company, New Delhi
5.P. C. Vergese, "Limit State Design", Prentice Hall India Publications, New Delhi
6. Sinha R.C. "RCC Analysis and Design- Vol. I, II", Chand and Co, New Delhi
I.S.Codes :
1.I.S.456-2000, "Plain and Reinforced Concrete-Code of Practice" 2.I.S.875-1987 (Part I to V),"Code of Practice for Design Loads" 3.SP-16-1980, "Design Aids for Reinforced Concrete"
Reference Books:
1.N.Subramanian" Design of Reinforced Concrete Structures" Oxford University Press
2.M.Fergusson " R.C.Fundamentals" - Tata Mcgraw Hill
3.S.Unnikrishnan Pillai,Devidas Menon "Reinforced Concrete Design"-Tata Mcgraw Hill Companies
4.Dr.H.J.Shah "Reinforced Concrete –Vol.1 (Elementary Reinforced Concrete)" –Charotar Publications

Syllabus for Unit Test:	
Unit Test -1	UNIT – I,II,III
Unit Test -2	UNIT – IV,V,VI

38: Environmental Engineering I

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 3
Practical: 2 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work & Practical : 50 Marks	Termwork : 1

Course Pre-requisites:

The Students should have knowledge of

1.	Engineering chemistry.
2.	Engineering mathematics.

Course Objectives:

	To make student aware of water treatment, air pollution, solid waste management and environmental management

Course Outcomes:

The student will be able to

1.	Explain the water quality criteria and drinking water quality standards.
2.	Explain aeration and sedimentation process of water treatment.
3.	Describe filtration, disinfection and advanced water treatment processes.
4.	Enumerate the various aspects of air pollution.
5.	Describe the solid and hazardous waste management.
6.	Explain the aspects of environmental management.

UNIT - I	**Water-Quantity, Quality and Standard**	**(06 Hours)**
	Water: Surface water sources, Ground water Sources, Water demand and quantity, various demands, Conveyance of water, Factors affecting demand, Design period, population forecasting, **Quality of Water**: Various Sources, Common impurities and their effects, Physical, Chemical, Biological, radiological characteristics of water, Drinking water quality standards, **Flow sheets:** Water Treatment Plant (WTP) based on sources of Raw water for Rural and Urban	
UNIT - II	**Treatment-Aeration and Sedimentation**	**(06 Hours)**
	Aeration: Types of aerators, gravity aerator and fixed spray aerator. **Sedimentation:** Plain Sedimentation, Principles and types of plain Sedimentation, details of Sedimentation tank, types of tanks, inlet and outlet arrangements; Design criteria like surface overflow rate, detention time, weir loading, depth of tank. Chemical assisted Sedimentation– Necessity, Unit operation, coagulation, Different coagulants, flocculation, factors affecting flocculation, Design of Clari-flocculator; Tube settlers: Introduction, Design of Tube settler	
UNIT - III	**Treatment- Filtration, Disinfection and Advance Technology**	**(06 Hours)**
	Filtration: Necessity, mechanisms, Theory of filtration, types of filters, pressure filters, dual and multimedia filters, Different media, details of filter, Rapid sand filter and slow sand filter, design criteria, working and washing of rapid sand filter, design of rapid sand filter. **Disinfection**: Necessity, Different methods, chlorination, reactions involved, Free And combined residual chlorine, Break point chlorination. UV disinfection, Ozonation **Advance Treatment Methods:** Water Softening- Chemical and ion exchange methods, Fluoridation and defluoridation, desalination, membrane technologies.	
UNIT - IV	**Air Pollution and Control**	**(06 Hours)**

	Air Pollution: History of Air pollutants, Sources and classification of pollutants and their effects on human health, vegetation and property. Ambient air quality and emission standards, **Air Pollution Control:** Principles, Removal of gaseous pollutants by adsorption, absorption, reaction and other methods, Particulate Matter Control: settling chambers, cyclone separation, Wet collectors, fabric filters, and electrostatic precipitators.	
UNIT - V	**Solid and Hazardous Waste Management**	**(06 Hours)**
	Solid and Hazardous Waste Management: Introduction, Sources, Legislations, Waste Generation, Composition, Source reduction of wastes, Handling and segregation of wastes at source, storage and collection, Transport, Labeling and Handling of Hazardous Wastes, Waste processing, Composting, Solid Wastes Disposal in Landfills, secure landfills and landfill bioreactors, landfill remediation, **Integrated Solid waste management**: Principles and Elements of Integrated Solid waste management.	
UNIT - VI	**Environmental Management**	**(06 Hours)**
	Environmental Management: Introduction, Principle, Fundamentals **Environmental Management Systems-** Introduction, ISO 14000 series, Environmental Management Plan, Eco – labeling, **Environmental Management Tools:** Life Cycle Assessment (LCA): Environmental Impact Assessment (EIA) and Environmental Audits **Environmental Legislation:** Rules and Regulations of Environmental laws in India (Water and Air),	
Assignments:		
1. Draw and explain flow sheets of water treatment plant for different types of water sources		
2. Numericals on design of flocculator, sedimentation tank and tube settler.		
3. Information about various types of filtration units		
4. National ambient air quality standards and control methods of air pollutants		
5. Experiences of solid waste management.		

6. EIA studies	
Term Work: (Any Eight experiments)	
11.	Determination of pH and alkalinity of water samples
12.	Determination of Total Hardness and its components of water samples
13.	Determination of Chlorides of water samples
14.	Determination of Turbidity and optimum dose of alum for raw water samples.
15.	Determination of Optimum dose of chlorine and residual chlorine for water samples.
16.	Determination of calorific value and/or energy content of the solid waste.
17.	Determination of concentration of trace metals (Al, Mn, Cu, Ni, Zn, Pb, Cd, Fe, N, P. K) from water, solid waste, air and soil samples.
18.	Determination of PM 2.5 in ambient air samples.
19.	Determination of concentration of Particulate matter and gaseous pollutants in industrial stack.
20.	Determination of concentration of carbon di-oxide from ambient air/industry/automobile
21.	Site visit
22.	Study of EIA report of infrastructure project.
Text Books:	
4.	Wark Kenneth and Warner C.F, Air pollution its origin and control. Harper and Row Publishers, New York, 1981.
5.	Rao C.S., Environmental pollution control Engineering, New age international Ltd, New Delhi, 1995.
6.	Peavy, H.S., Rowe, D.R., Tchobanoglous, G. Environmental Engineering, McGraw Hills, New York 1985.
7.	George Tchobanoglous, Hilary Theisen and Samuel A, Vigil, Integrated Solid Waste Management, McGraw- Hill, New York, 1993

8. CPHEEO, Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organization, Government of India, New Delhi, 2000.

9. Dr. M. N. Rao and Dr. Razia Sultana, ‘ Solid and Hazardous Waste management’ BSP Books Pvt. Ltd. 2012

10. I. V. Murali Krishna and Valli Manickam,’Environmental Management’, BSP, Books Pvt. Ltd. 2014

Reference Books:

1. S.K. Friedlander: Smoke Dust and Haze: Fundamentals of Aerosol Behavior, Wiley 1977.
2. Steven C. Chapra, Surface Water Quality Modeling, Tata McGraw-Hill Companies, Inc., New Delhi, 1997.
3. J.L. Schnoor, Environmental Modeling Fate and Transport of Pollutants in Water, Air and Soil, John Wiley & Sons Inc., New York, 1996.
4. Arthur C. Stern, Air Pollution, Air Pollutants, their transformation and Transport, (Ed.), (Third Ed.) Volume I , Academic Press, 2006.
5. Solid Waste Management, Van Nostrand Reinhold Co. 1975
6. C.L. ell, Solid Waste Management, John Wiley, 1975
7. P.W. Powers. How to dispose of toxic substances and industrial Waste, Noyes Data Corporation, England, 1976.

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

39 Estimating, Costing and Valuation

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory -4
Practical: 2 Hours / Week	Continuous Assessment: 40 Marks	Termwork -1
Tutorial : 1 Hour/ week	Term Work & Oral : 50 Marks	

Course Pre-requisites:

The Students should have knowledge of

1.	Building Construction and Building planning and Design.
2.	Structural Design I and Structural Design II.
3.	Surveying and leveling
4.	Environmental Engineering I
5	Infrastructure Engineering

Course Objectives:

	To prepare the students to make estimate of building, road, and other civil engineering structures

Course Outcomes:

The student will be able to

1.	explain the specifications for different construction works and materials..
2.	prepare estimate of the buildings, and other civil engineering structures.
3.	.carryout rate analysis of different items of construction work
4.	Carry out valuation of civil engineering structures.

5.	fill the tender documents.
6.	compare different types of contracts

UNIT - I		**(6 Hours)**
	Estimating: Definition, importance of quantity surveying, types of estimates, data required for estimates, units of measurement & principles deciding the units, mode of measurement of building works. Abstracting, bill of quantities. Provisional & prime cost items, contingencies, establishment charges, centage charges, Schedule of rates (D. S. R.) **Approximate Estimate:** Definition, purpose, methods of approximate estimation of building & other civil engineering projects like roads, irrigation & water supply &sanitary engineering, electrical works.	
UNIT - II		**(6 Hours)**
	Methods of Taking out quantities: long wall, short wall method and centre line method of taking out quantities for different items of building. Estimate of RCC members. IS Codes used for estimating. **Specifications:** Definition & purpose, types, standard specifications. Drafting detailed specifications with reference to materials, quality, workmanship, method of execution, mode of measurement and payment, for major items such as earthwork, stone/brick masonry, plastering, ceramic tile flooring, R.C.C. work.	
UNIT - III		**(6 Hours)**
	Analysis of rates: Factors affecting cost of an item of work, materials, sundries, lab our, Tools & plant, overheads & profit. Task work - definition & factors affecting task work. Analysis of rates of any five items. **Estimate of Road:** Methods of estimate of earthwork for road, canal. Estimate of different types of roads.	
UNIT - IV		**(6 Hours)**

	Valuation of Properties: Purpose, nature of value, price, cost and value, types of value. Factors affecting value of property. Concept of free hold and lease hold property. Depreciation & methods of working out depreciation, sinking fund, Years purchase, out goings. Methods of Valuation of Building: Land & building basis, Rental basis, Reproduction & replacement cost basis. O_1 form.	
UNIT - V		**(6 Hours)**
	Tenders: Definition. Methods of inviting tenders, tender notice, Pre- qualifications of contractor, tender documents, preparation of tenders. Submission in 3 bid/ 2 bid or single bid system. Qualitative and quantitative evaluation of tenders, E tendering. Comparative statement, pre- bid conference, acceptance of tenders, various forms of BOT tenders, global tendering. (A mockup exercise of preparation, submission, opening of tender documents is suggested). PPP contracts.	
UNIT - VI		**(6 Hours)**
	Contracts: General idea, types of contracts viz: lump sum, item rate, cost plus, Conditions of contracts. FIDIC document, standard contract conditions published by MOS and PI, Law of contract. Definition, objective & essentials of valid contract. **Conditions of contract:** General and Specific conditions. Condition regarding EM, SD, time as an essence of contract. Important conditions regarding addition, alteration, extra items, testing of materials, defective work, subletting, powers delegated to Engineer incharge regarding the above aspect, defect liability period, retention money, interim payment or running account bills, advance payment, secured advance, final bill. Settlement of disputes viz. dispute resolving board, arbitration, concept of partnering. Indian Contract Act. Liquidated damages, termination of contract.	
Assignments		
1. Approximate estimate of different types of buildings		
2. To determine quantities of different items of building and preparation of specifications for construction materials (Any five)		

3. Rate analysis.
4. To carryout the valuation of existing building.
5. Mock up exercise of submission of tender.
6. Types of contracts.
Term Work:
1.Estimate of different structures using long wall short wall method and centre line method
2.Detailed estimate of a single storied R. C. C. framed building using D.S.R. rates
3.Working out quantities of steel reinforcement for a slab, a beam, column footing and preparing bar bending schedule.
4. a)Detailed estimate of roadwork . b) Assignment on road earthwork calculations.
5.Estimating quantities for any two of the following a) House drainage & water supply arrangement. b) Pipe culvert or slab culvert c) Septic tank.
6.Drafting detailed specifications of any five items .
7. Assignment on valuation of building. (O_1 form)
8.Preparation of draft tender notice.
9. Rate analysis for any five items.
Text Books:
1. Estimating and Costing By: Rangwala Published By: Charotar Publishing House, Anand
2.Estimating, Costing Specifications & valuation in Civil Engineering By: M.Chakraborty
Reference Books:
1.Estimating and Costing in Civil Engineering: Theory and Practice, By: B.N Dutta. Published By: S. Dutta & Company, Lucknow.
2.Civil Engineering Contracts & Estimates By: B.S.Patil Published, Orient Longman Ltd. Mumbai.
3.I.S.1200 (Part 01 to 25): Methods of Measurement of Building and Civil Engineering Works.
4. D.S.R: District Schedule of Rates

Syllabus for Unit Test:	
Unit Test -1	UNIT – I,II,III
Unit Test -2	UNIT – IV, V, VI

40: Geotechnical Engineering

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory: 03
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	Termwork : 01
	Term Work & Oral : 50 Marks	

Course Pre-requisites:

The Students should have knowledge of

1.	Engineering Mathematics
2.	Engineering Mechanics
3.	Fluid Mechanics

Course Objectives:

	To make student capable to determine the properties of soil and use of soil as a construction material.

Course Outcomes:

The student will be able to

1.	determine weight - volume relation in soil as a three phase system
2.	determine index properties of soil.
3.	explain the compaction and consolidation process.
4.	calculate the geostatic stresses and coefficient of permeability.
5.	measure the shear strength of soil by various methods.
6.	calculate the active and passive earth pressure by various methods.

UNIT - I	**Introduction to soil mechanics**	**(6 Hours)**
	Soil, Soil formation, soil types its composition, soil structures, clay mineral, soil mechanics, history and development of soil mechanics, basic definitions, weight volume relations in soil as three phase system, soil classification systems – USCS, IS, HRB, Textural classification, Activity of clay, Sensitivity of clay, Thixotrophy of clay	
UNIT - II	**Index Properties of Soil**	**(6 Hours)**
	Index properties of soil – Water content, specific gravity, particle size distribution, Consistency limits, density, relative density	
UNIT - III	**Permeability and Seepage Analysis**	**(6 Hours)**
	Stresses within a soil, effective stress principle, stress point and stress path, Soil - water systems- capillarity, flow, Darcy's law, permeability, and tests for its determination, head gradient and potential, seepage pressure, Upward flow condition, 2 D flow, Laplace equation, flow net and applications	
UNIT - IV	**Compaction and Stress Distribution**	**(6 Hours)**
	Compaction: - Laboratory compaction tests; Factors affecting compaction; Structure and engineering behaviour of compacted cohesive soils; Field compaction; compaction specifications and field control. Stresses in soil: Geostatic Stresses, stress distribution, Bossinsque's Theory for point load, Westergaard's theory	
UNIT - V	**Shear Strength**	**(6 Hours)**
	a) Introduction- Shear strength an Engineering Property. Mohr's stress circle, Mohr-Coulomb failure theory. The effective stress principle- Total stress, effective stress and neutral stress / pore water pressure. Peak and Residual shear strength, factors affecting shear strength. Stress-strain behavior of sands and clays. b) Measurement of Shear Strength- Direct Shear test, Triaxial Compression test, Unconfined Compression test, Vane Shear test. Their suitability for different types of soils, advantages and disadvantages. Different drainage conditions for shear tests.	
UNIT - VI	**Earth Pressure Theories**	**(6 Hours)**

	a) Earth Pressure- Introduction, Rankine's state of Plastic Equilibrium in soils- Active and Passive states due to wall movement, Earth Pressure at rest. Rankine's Theory- Earth pressure on Retaining wall due to submerged backfill, b) Backfill with uniform surcharge, backfill with sloping surface, layered backfill. Coulomb's Wedge theory. Rebhann's graphical method of determination of earth pressure.	

Term Work:

Term work shall consist of the following experiments (Any Ten)

1.	Determination of water content by oven drying method
2.	Determination of specific gravity of coarse and fine grained soil
3.	Classification of soil by sieve analysis
4.	Determination of consistency limits – Liquid, plastic and shrinkage limit
5.	Determination of in situ density test – Core cutter and sand replacement method
6.	Determination of coefficient of permeability by – a) Constant Head Method b) Falling Head Method
7.	Determination of OMC and MDD by Standard Proctor Test and Modified Proctor Test
8.	Determination of shear parameters by Direct Shear Test.
9.	Determination of Unconfined Compression Strength of soil
10.	Determination of shear parameters Triaxial Shear Test
11.	Determination of shear parameters Vane Shear Test

Assignments:

1. Study of various relationships between weight and volume, numerical based on it and classification of soil.
2. Classification of soil based on the index properties of soil.
3. Study of permeability and numerical based on it.
4. Study of Proctor tests, different field compaction equipments.
5. Determination of shear strength, numerical problems based on it.
6. Numerical problems based on earth pressure.

Text Books:

1. Murthy, V.N.S., "Text Book of Soil Mechanics and Foundation Engineering", CBS Publishers.
2. Ranjan, G. and Rao, A.S.R., "Basic and Applied Soil Mechanics", New Age International Publishers.
3. K. R. Arora, " Soil Mechanics & Foundation Engineering,
4. Punmia B.C., "Soil Mechanics and Foundation Engineering" Laxmi Publications
5. C. Venkatramaiah, "Geotechnical Engineering", New Age International Publishers
6. Gulati, Manoj Dutta, "Geotechnical Engineering", Tata McGraw Hill Publications
Reference Books:
10. Terzaghi Karl, Ralph B. Pech, "Soil Mechanics in Engineering Practice", A Wiley International Edition.
11. Holtz, R.D. and Kovacs, W.D., "An Introduction to Geotechnical Engineering", Prentice Hall.
12. Lambe, T.W. and Whitman, R.V., "Soil Mechanics", John Wiley and Sons.
13. Couduto, D.P., "Geotechnical Engineering – Principles and Practices", Prentice Hall of India.
14. Das, B.M., "Principles of Geotechnical Engineering", Thomson Asia.
15. Korner Robert M. " Construction and Geotechnical Engineering" Tata McGraw Hill Publications Company, New Delhi
16. Joseph E. Bowels, "Soil mechanics and Foundation Engineering", Tata McGraw Hill Publications Company, New Delhi

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

41 A: Elective-I: Financial Management

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory - 03
	Continuous Assessment: 40 Marks	

Course Pre-requisites:

The Students should have knowledge of

1.	Project Management
2.	Economics and Management
3.	Construction Techniques and machinery.

Course Objectives:

	Students are expected to prepare company's financial position for decision making.

Course Outcomes:

The student will be able to

1.	manage financial planning of a construction project.
2.	forecast financial requirement of a construction firm.
3.	analyze Time-Value of Money.
4.	determine working capital for construction Project.
5.	apply theories of capital structures.
6.	carry out risk analysis of budget.

UNIT - I	**Introduction to Financial Management**	**(6 Hours)**

	Scope and Functions of Financial Management, Role of Finance Manager, Organization of the Finance function, Financial Planning, Financial Statement Analysis	
UNIT - II	**Financial Planning**	**(6 Hours)**
	Introduction, Objectives and steps in Financial planning, Factors affecting financial planning, estimation of financial requirement of a construction firm, Capitalization, Sources of Financing	
UNIT - III	**Capital Budgeting**	**(6 Hours)**
	Time Value of money – Future value of a single cash flow, annuity, Present value of Single Cash flow, Present Value of Uneven Cash flow, Discounting and Non-discounting techniques – NPV, IRR, BCR and Payback period.	
UNIT - IV	**Working Capital Management**	**(6 Hours)**
	Importance and Objectives, factors affecting working Capital, Determination of Working Capital, Working capital financing policy	
UNIT - V	**Capital Structure**	**(6 Hours)**
	Introduction, Salient features of Capital Structure, Factors influencing capital structure, Theories of Capital structures – EBIT and MM approach, Financial Management in India	
UNIT - VI	**Risk Analysis in Capital Budgeting**	**(6 Hours)**
	Introduction, Types and Sources of Risk in Capital Budgeting, Risk Adjusted Discount Rate, Certainty Equivalent Approach, Probability Distribution Approach, Sensitivity Analysis, Simulation Analysis	

Assignments: (Any Six)

12.	Assignment on Financial Management.
13.	Assignment on Financial Planning.
14.	Assignment on Balance Sheet & Profit-Loss statement.
15.	Assignment on Cash flows.
16.	Assignment on NPV, BCR and IRR
17.	Assignment on working Capital Management with reference to case study.

18.	Assignment on EBIT approach.
19.	Assignment on MM approach.
20.	Assignment on sensitivity analysis.
21.	Assignment on simulation.
Text Books:	
11.	Financial Management, I.M. Pande, Vikas Publication
12.	Financial Management, C. Paramasivam & T. Subramaniam, New Age International (P) Limited, Publishers.
Reference Books:	
17.	Financial Management, An Introduction, Jim Mc Menamin, Taylor and Francis
18.	Financial Management, M.Y. Khan, P.K. Jain, Tata McGraw Hill Publication
19.	Financial Management, Prasanna Chandra, Tata McGraw Hill Publication

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II & III
Unit Test -2	UNIT – IV, V & VI

41 B: Elective-I - Advanced Structural Analysis

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 3
	Continuous Assessment: 40 Marks	

Course Pre-requisites:

The Students should have knowledge of

1.	Structural Analysis- I
2.	Structural Analysis- II

Course Objectives:

	The student should able to analyse the structure.

Course Outcomes:

The student will be able to

1.	calculate deflection of beams and frames using Castigliano's first theorem.
2.	analyze deflection of beams and frames using Castigliano's second theorem,
3.	analyze indeterminate beams using Stiffness matrix method.
4.	analyze indeterminate frames using Stiffness matrix method.
5.	analyze indeterminate beams using Flexibility matrix method.
6.	analyze indeterminate frames using Flexibility matrix method.

UNIT - I	**Deflection of Beams and Plane Frames using Strain Energy Method:**	**(06 Hours)**

	Deflection of determinate beams and rectangular portals by application of Castigliano's first theorem;	
UNIT - II	**Analysis of Beams and Plane Frames using Strain Energy Method:**	**(06 Hours)**
	Analysis of indeterminate beams and rectangular portals by application of Castigliano's second theorem with indeterminacy up to two degrees;	
UNIT - III	**Analysis of Beams using Stiffness Matrix Method:**	**(06 Hours)**
	Stiffness matrix method of analysis, Formulation of stiffness matrices, Applications to indeterminate beams. (Involving not more than three unknowns).	
UNIT - IV	**Analysis of Plane Frames using Stiffness Matrix Method:**	**(06 Hours)**
	Formulation of stiffness matrices for frames, Applications for rigid jointed indeterminate rectangular plane frames. (Involving not more than three unknowns).	
UNIT - V	**Analysis of Beams using Flexibility Matrix Method:**	**(06 Hours)**
	Flexibility matrix method of analysis, Formulation of flexibility matrices, Applications to indeterminate beams. (Involving not more than three unknowns).	
UNIT - VI	**Analysis of Plane Frames using Flexibility Matrix Method:**	**(06 Hours)**
	Formulation of flexibility matrices for frames, Applications for rigid jointed indeterminate rectangular plane frames. (Involving not more than three unknowns).	

Assignments:

1) Calculate deflection of beams using Castigliano's first theorem
2) Analyse indeterminate beams or rectangular portals by application of Castigliano's second theorem
3) Calculate stiffness matrix for beams
4) Calculate stiffness matrix for frames
5) Calculate flexibility matrix for beams
6) Calculate flexibility matrix for frames

Reference Books:	
1) Hibbeler R. C., “Structural Analysis”, Prentice Hall Publication	
2) Pandit G. S. & Gupta S. P., “Matrix Methods of Structural Analysis”, Tata McGraw Hill Publication	
3) Asslam Kassimali, "Matrix Analysis of Structures", Brooks/Cole Publishing Co.	
4) Amin Ghali, Adam M Neville and Tom G Brown, "Structural Analysis: A Unified Classical and Matrix Approach", Sixth Edition, 2007, Chapman & Hall.	
5) Wilbur & Norris, “Basic Structural Analysis” Tata McGraw Hill Publication	
6) Reddy C. S., “Basic Structural Analysis”, Tata McGraw Hill Publication	
7) Timoshenko S. P. & Young, “Theory of Structures”, McGraw Hill Publication	
8) Ramamrutham S. & Narayan R., “Theory of Structures”, Dhanpat Rai Publishing Company	
9) Timoshenko S. P. & Young, “Theory of Structures”, McGraw Hill Publication	
10) Junnarkar S. B. & Adavi, “Mechanic of Structures”, Charotar Publishing House	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

41 C: ELECTIVE I: URBAN WATER MANAGEMENT

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hours / Week	End Semester Examination : 60 Marks	Theory :03
	Continuous Assessment : 40 Marks	

Course Pre-requisites:

The Students should have knowledge of

1.	Physics, Chemistry, Mathematics and Statistics
2.	Ecology, Hydrology, Environment and Climate Change
3.	Water Engineering and Management

Course Objectives:

To learn Urban Water Management (UWM) which promises a better approach than the current system, in which water supply, sanitation, storm water and wastewater are managed by isolated entities, and all four are separated from land-use planning and economic development and adopt UWM and its adaptive, iterative processes will help cities significantly reduce the number of people without access to water and sanitation by providing water services of appropriate quantity and quality, thereby improving the health and productivity of urban residents.

Course Outcomes:

The student will be able to

1.	Understand how cities are growing and changing which is leading to describing the promise of IUWM and how some city case studies that explore the ways in which aspects of IUWM have been put into practice, since every city faces a different challenge and requires context-appropriate solutions.
2.	Focus on the implications of these changes for urban water resources: in the past, water security efforts focused on water quantity and understand how new concerns about water quality are now emerging.

3.	Understand and design the new tools and strategies to shift from urban water management to IUWM, and develop flexible and adaptable urban water systems.	
4.	Gain insight that how UWM can contribute to cities' resilience in the face of climate change and analyze changing climate demanding water management be approached in a different way.	
5.	Understand, apply and develop an enabling environment for the change toward a framework for integrated urban water management.	
6.	Design, analyze and apply practical approaches for constructing and building GREEN and SMART cities that are inclusive, productive, well governed, and sustainable which leads to foster a new culture of urban water management.	
UNIT - I	**Introduction to Urban Water Management**	**(6 Hours)**
	Introduction to Urban Water Management (UWM): Concept, Need, The changing urban context, Expanding city limits, Consequences of globalization and Urbanization, Urban-Rural Conflicts, Special challenges for some cities	
UNIT - II	**Water resources and urbanization**	**(6 Hours)**
	Water: Sources, Quantity and Quality, Wastewater: Sources, Quality and Reuse , Effects on Water Demand due to Urbanization, Water Cess Act, Water(Prevention and Control) Act 1974	
UNIT - III	**UWM tools and management strategies**	**(6 Hours)**
	Storm water management, Water reclamation and reuse, Water audits and efficient use, Flexible and adaptable urban water systems, Tariffs, payments and other economic tools, Benefit Cost Ratio for Urban Water Management	
UNIT - IV	**Climate Change Challenge**	**(6 Hours)**
	Climate Change: Introduction, Cause and Consequences, Climatic Variations in India in recent years, Effect of Climate change on Water Resources and Sanitation, Urban contributions to climate change, Response options , Resilience to climate change	
UNIT - V	**Conventional and Integrated Urban Water Management**	**(6 Hours)**
	Conventional Urban Water Management: Introduction, Present Scenario, Advantages and Disadvantages, Integrated Urban Water Management (IUWM): Introduction, Need, Advantages, Urban water governance, Application of IUWM for SMART CITY	

UNIT - VI	**Framework for integrated urban water management**	**(6 Hours)**
	Role of Central and Local governments, Involvement of Private sector, Business opportunities and Employment Enhancement, Participation of NGO's and Stakeholder, Sustainable Development and Practices	

Assignments:

1. Collection of data how cities are growing and changing describing the promise of IUWM
2. Study of urban water resources: in the past and how new concerns about water quality are now emerging.
3. Design new tools and strategies to shift from Conventional urban water management to IUWM
4. Study and data collection of climate change and analyze changing climate demanding water management be approached in a different way.
5. Design framework for integrated urban water management for Existing and Futuristic SMART Cities
6. Design, analyze and apply practical approaches for constructing and building GREEN and SMART cities to foster a new culture of urban water management.
7. Field Visit and Report on SMART City and/orTownship in India and/or abroad

Text Books:

1. Urban Water Engineering and Management by Mohammad Karamouz, Ali Moridi, Sara Nazif, January 20, 2010 by CRC Press Textbook, ISBN 9781439813102 - CAT# K10665
2. Municipal Stormwater Management, Second Edition by Thomas N. Debo, Andrew Reese, November 25, 2002 by CRC Press, Reference – 1176, ISBN 9781566705844 - CAT# L1584
3. Urban Storm Water Management by Hormoz Pazwash, April 28, 2011 by CRC Press, Reference – 550, ISBN 9781439810354 - CAT# K10518
4. Integrated Urban Water Management: Humid Tropics: UNESCO-IHP by Jonathan N. Parkinson, Joel Avruch Goldenfum, Carlos Tucci, March 26, 2010 by CRC Press, Reference – 180, ISBN 9780415453523 - CAT# K10165, Series: Urban Water Series
5. Water in Central Asia: Past, Present, Future by Victor A. Dukhovny, Joop de Schutter, January 25, 2011 by CRC Press, Reference – 432, ISBN 9780415459624 - CAT# K00021
6. The Economics of Sustainable Urban Water Management: the Case of Beijing: UNESCO-IHE PhD Thesis by Xiao Liang, September 28, 2011 by CRC Press, Reference – 200, ISBN 9780415691734 - CAT# K13927
7. Climate Change Effects on Groundwater Resources: A Global Synthesis of Findings and Recommendations by Holger Treidel, Jose Luis Martin-Bordes, Jason J. Gurdak, December 2, 2011 by CRC Press, Reference – 414, ISBN 9780415689366 - CAT# K13833, Series: IAH - International Contributions to Hydrogeology
8. Metropolitan Sustainability: Understanding and Improving the Urban Environment Edited by F Zeman, Royal Military College of Canada, Canada, September 2012, Woodhead Publishing, ISBN: 978-0-85709-046-1
9. Designing the Urban Future: Smart Cities Kindle Edition by Scientific American Editors, Kindle Edition, Kindle eBook, 31 Mar 2014

10. Urban Water Supply and Sanitation in Southeast Asia: A Guide to Good Practice by Arthur C. McIntosh, ASIAN DEVELOPMENT BANK, ISBN 978-92-9254-554-3 (Print), 978-92-9254-555-0 (PDF), Publication Stock No. TIM135915-2
11. Water Resources and Economics In association with International Water Association (IWA), Editor-in-Chief: Prof. Dr. Roy Brouwer, ISSN: 2212-4284, ELSEVEIR
12. Water and Cities: Ensuring Sustainable Futures, Apr 2015, ISBN : 9789264230149 (PDF) ; 9789264230101 (print)
13. Water Management: Performance and Challenges in OECD Countries, Mar 1998, ISBN : 9789264162600 (PDF) ; 9789264160781 (print)
14. Good Practices in Urban Water Management: Decoding Good Practices for a Successful Future Edited by Anand Chiplunkar, Kallidaikurichi Seetharam,Cheon Kheong Tan, 2012, Asian Development Bank, National University of Singapore, ISBN 978-92-9092-740-2 (Print), 978-92-9092-741-9 (PDF), Publication Stock No. BKK102333
15. Strategic Planning of Sustainable Urban Water Management, P-A Malmqvist, G Heinicke, E Korrman, TA Stenstrom, G Svensson, 2006, IWA Publishing, ISBN13: 9781843391050, eISBN: 9781780402413, Categories: Utility / network management, Urban water
17. Climate Change and Water: International Perspectives on Mitigation and Adaptation edited by Carol Howe, Joel B. Smith, MS. Jim Henderson, American Water Works Association and IWA Publishing, ISBN: 978-1-58321-730-6
18. Climate Change and Water Resources by Younos, Tamim, Grady, Caitlin A (Eds.) , ISBN 978-3-642-37586-6, Springer, USA
19. Climate Change, Water Supply and Sanitation: Risk Assessment, Management, Mitigation and Reduction by Adriana Hulsmann, Gesche Grützmacher, Gerard van den Berg, Wolfgang Rauch, Anders Lynggaard Jensen, Victor Popovych, Mario Rosario, Lydia S. Vamvakeridou-Lyroudia, Dragan A. Savic, 2015, ISBN13: 9781780404998, eISBN: 9781780405001, Categories: Developing Countries, Water resources / environment, Water supply & treatment

Reference Books:

1. Integrated Urban Water Management By Akiça Bahri, Global Water Partnership Technical Committee (TEC), TEC BACKGROUND PAPERS, NO. 16, ISBN: 978-91-85321-87-2

2. Good Practices in urban water management: Decoding good practices for a successful future edited by Chiplunkar, Anand, Kallidaikurichi Seetharam, and Cheon Kheong Tan, Mandaluyong City, Philippines: Asian Development Bank, 2012, ISBN 978-92-9092-740-2 (Print), 978-92-9092-741-9 (PDF)

3. Integrated Urban Water Management for Planners By John Y. Whitler and Jennifer Warner, Water Research Foundation, PAS Memo — September/October 2014, American Planning Association, 205 N. Michigan Ave., Ste. 1200, Chicago, IL 6060

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III

Unit Test -2	UNIT – IV, V, VI

41 D: Elective-I: Docks, Ports and Harbours

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory: 03
	Continuous Assessment: 40 Marks	

Course Pre-requisites:

The Students should have knowledge of

1.	Fluid Mechanics
2.	Advanced Surveying (Hydrographic Survey)

Course Objectives:

	To study different marine structures and their design considerations.

Course Outcomes:

The student will be able to

1.	describe development of port.	
2.	describe the wave, tide and the phenomenon related to the same.	
3.	explain different harbour and port facilities.	
4.	design the breakwaters.	
5.	explain the port planning.	
6.	explain marine pollution.	
UNIT - I	**Introduction to Ports and Harbours**	**(6 Hours)**

	History, development of port and ship construction technology along with International trade, Port Development – Indian Scenario	
UNIT - II	**Waves and Tides**	**(6 Hours)**
	Concept of generation, propagation and form of wave in coastal zone, global tide phenomenon, types of tides concept of wave tranquility, resonance, coastal sediment transport	
UNIT - III	**Ports and Harbours**	**(6 Hours)**
	Harbour : classification, facilities and structures, Approcah channel, Marker Buoys, Breakwater layout, Berth and Jetties, Bulk oil container Ports: Loading unloading, storage, Customs and relevant facilities, security, hospital colony, Associated Services, Maintenance facilities, Dry docks, Slipway, locks.	
UNIT - IV	**Marine Structures**	**(6 Hours)**
	General design aspects, breakwaters - function, types general design principles, wharves, quays, jetties, piers, pier heads, dolphin, fenders, mooring accessories- function, types, suitability, design and construction features.	
UNIT - V	**Port Planning**	**(6 Hours)**
	Modernization of port, Lifting and loading unloading (RORO) facilities, Computerization, Automation, berth occupancy, Port Cost Analysis, Dredging and disposal technology	
UNIT - VI	**Port Development**	**(6 Hours)**
	Role of port development and national policy, Public and private sector, Marine pollution and environmental aspects.	

Assignments:

1. Explain history and development of port in India.
2. Write the concept of wave generation and propagation in coastal zone
3. Explain the facilities provided at ports and harbours.

4. Design a breakwater with the data given.	
5. Write different aspect of port planning.	
6. National policy for port development and environmental aspect of it.	
7. Site visit to CW & PRS	
Text Books:	
1. Basic Coastal Engineering, R.M.Sorenson, J.Wiley & Sons, 1978	
2. Docks and Harbour Engineering,H.P.Oza and G.H.Oza, Charotar Publishing 2013	
3. A Course in Docks and Horbour Engineering, S.P.Bindra, Dhanpatrai Publications	
4. Harbour, Dock and Tunnel Engineering,R.Shrinivasan, Charotar Publishing House Pvt.Ltd (2013)	
Reference Books:	
1.Oceanographical Engineering, R.L.Wiegel, Prentice –Hall 1964	
2.Coastal Engineering, Vols. 1 and 2 , R. Silvester Elsevier Scientific Publishing Co., 1974	
3.N I O Design Manual	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

41 E: Elective-I: HUMAN RESOURCE MANAGEMENT

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 03
	Continuous Assessment: 40 Marks	

Course Pre-requisites:

The Students should have knowledge of

1.	Engineering Economics Management
2.	Project Management

Course Objectives:

	To develop the skill of human resource management in construction industry.

Course Outcomes:

The student will be able to

1.	discuss the significance of human resources in construction industry.
2.	plan human resources.
3.	describe the recruitment and selection process.
4.	discuss the significance of training and development of employees.
5.	analyze the employee benefits and incentives.
6.	describe employee management relations.

UNIT - I	**Introduction**	**(6 Hours)**
	History of HRD, Objectives, Functions, HRD in Construction industry, status of construction labour.	
UNIT - II	**Human Resource Planning**	**(6 Hours)**

	Formulating human resource plans, various methods, job analysis, job specifications and job design in construction projects, forecasting personal needs and supply in construction sector.	
UNIT - III	**Recruitment & selection**	**(6 Hours)**
	Selecting project manager & project team, external & internal recruitment. Data gathering methods, skill requirement of construction personnel.	
UNIT - IV	**Training & Development**	**(6 Hours)**
	The training Process, Individual and organizational development, change management, performance appraisal, use of performance appraisal information establishing the evaluation system, Performance Management / Encouragement, Rewarding Employees	
UNIT - V	**Employee Benefits**	**(6 Hours)**
	Employee health and safety, wage and salary administration, incentive system, wages of construction industry, retirement and pensions.	
UNIT - VI	**Employee Management Relations**	**(6 Hours)**
	Collective Bargaining, Effective ways of working, trade unions act, labour welfare act, payment of wages act ,workers compensation act ,contract labour act, management of conflicts.	

Assignments:

1. Case study of HRD in construction industry
2. Formulating human resource plan
3. Case study of external and internal recruitment
4. Report on establishing evaluation system for performance appraisal
5. Importance on Employee benefits
6. Report on conversation with HR of any construction industry

Text Books:

13. "Human Resource Development and Management" by "Biswanath Ghosh", Vikas Publishing House Pvt. Ltd.

14. "Human Resource Management" by "S.C. Agarwal", Dhanpat Rai Publications

15. Personnel & Human resource Management – C.B. Mamoria, Himalaya Publishing House

Reference Books:

20.	Human resource management – Subbarao, Himalaya Publishing House
21.	Human Resource Management— K. Aswathappa, TMH Pvt. Ltd
22.	“Human Resource Management” by “John Stredwick”
23.	International Human Resource Management--- Gary Diesler

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

41 F: Elective-I - Green Construction Practices.

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory: 03
	Continuous Assessment: 40 Marks	

Course Pre-requisites:

The Students should have

	basic knowledge of conventional construction practices, green materials and immerging trends in the green building industry.

Course Objectives:

1.	To understand the concept of sustainability and sustainable development
2.	To familiarize students with various environmental issues
3.	To familiarize students with various Green Building Rating Systems
4.	To understand selection criteria and implementation options for various green material
5.	To inform the various alternatives materials and construction practices.
6.	To inform the various recycled and innovative materials and construction techniques through case studies.

Course Outcomes:

The student will be able to

1.	evaluate the immerging trends in the fields of sustainable development and environment.
2.	evaluate the effects of construction industry on environment.
3.	understand the various evaluation systems for green buildings.

4.	implement various green material selection and construction techniques.	
5.	determine immerging trends in alternative materials and construction techniques.	
6.	determine immerging trends in the field of recycled and innovative materials	
UNIT - I	**Introduction to Sustainable Development**	**(06 Hours)**
	Basic Concepts of Sustainable Development - History of sustainable development in India and around the world – Sustainable Development an overview Bruntland Commission, UNFCCC – Goals of sustainable development – Energy, Environment and Financial sustainability	
UNIT - II	**Environment Management and Impact Assessment**	**(06 Hours)**
	Environment Management Basic: Introduction to biodiversity, Ecosystem and impacts of climate change on environment Environment Laws and Policies: EP Act (Environment Protection Act) Acts related to pollution and climate change	
UNIT - III	**Sustainable Architecture and Green Buildings**	**(06 Hours)**
	Green Ratings System: in India and around the world- an introduction Green Rating Systems in India : LEED (IGBC), Griha – Ecohousing,	
UNIT - IV	**Green Building Materials and Construction Techniques**	**(06 Hours)**
	Introduction to Green materials – Life Cycle Analysis – Life Cycle Cost Analysis – Selection criteria of Materials and Construction Techniques Green Buildings.	
UNIT - V	**Alternative Material and Construction Techniques:**	**(06 Hours)**
	Bamboo, ferrocrete, cob-adobe, etc and their construction techniques.	
UNIT - VI	**Recycled and Innovative Materials and Construction Techniques**	**(06 Hours)**
	Recycled glass, plastic, recycled debris block. Process of manufacture and construction.	
Assignments:		

22.	Assignment on various building practices carried out conventionally and the consequences.
23.	Assignment on Eco system and food chain,
24.	Assignment on Environmental Impact.
25.	Report writing on Green Material.
26.	Report writing on Indoor Environmental Quality Enhancement facilities.
27.	Case Studies

Text Books:	
16.	Dominique Gauzin – Muller "Sustainable Architecture and Urbanism: Concepts,
17.	Slessor, Eco-Tech : "Sustainable Architecture and High Technology", Thames and Hudson
18.	Ken Yeang, "Ecodesign : A manual for Ecological Design", Wiley Academy, 2006.
Reference Books:	
1.	Francis D.K. Ching, Ian M. Shapiro : "Green building Illustrated"
2.	**Kumar**, Surender, **Managi**, Shunsuke: "The Economics of Sustainable Development The Case of India "

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

41 G: Elective-I*:* Numerical Methods in Civil Engineering

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 3
	Continuous Assessment: 40 Marks	

Course Pre-requisites:

The Students should have knowledge of

1.	Engineering Mathematics
2.	Concept of differentiation and integration
3.	Partial differential equations.

Course Objectives:

	To give a broad background to numerical methods common to various branches of civil engineering to the student.

Course Outcomes:

The student will be able to

1.	find out core concepts of error estimate and accuracy of numerical solutions.
2.	use direct solutions of linear systems.
3.	use iterative solutions of linear systems.
4.	use direct solutions of non-linear systems.
5.	use numerical solutions to solve partial differential equations.
6.	use numerical integration methods to solve partial differential equations.

UNIT - I	**Introduction to Numerical Methods.**	**(6 Hours)**

	Introduction, need of studying numerical methods, Sources of error in numerical solutions: truncation error, round off error. Order of accuracy - Taylor series expansion.	
UNIT - II	**Direct Solutions of Linear Systems**	**(6 Hours)**
	Gauss elimination, Gauss Jordan elimination. Pivoting, inaccuracies due to pivoting. Factorization, Cholesky decomposition.	
UNIT - III	**Iterative Solutions of Linear Systems**	**(6 Hours)**
	Jacobi iteration. Gauss Seidel iteration. Convergence criteria.	
UNIT - IV	**Direct Solutions of Nonlinear Systems**	**(6 Hours)**
	Newton Raphson iterations to find roots of a 1D nonlinear equation. Generalization to multiple dimensions. Newton Iterations, Quasi Newton iterations. Local and global minimum, rates of convergence, convergence criteria.	
UNIT - V	**Numerical Methods to solve partial differential equations.**	**(6 Hours)**
	Difference operators (forward, backward and central difference), Stability and accuracy of solutions, Application of finite difference operators to solve initial and boundary value problems. Numerical quadrature: Trapezoidal rule, simpsons rule, Gauss quadrature**.**	
UNIT-VI	**Numerical integration of time dependent partial differential equations**	**(6Hours)**
	Parabolic equations: algorithms - stability, consistency and convergence, Lax equivalence theorem. Hyperbolic equations: algorithms - Newmark's method, stability and accuracy, convergence, multi-step methods.	

Assignments: Any Six

1.Assignment problem based on ‘Gauss -Jordan Method’.

2. Assignment problem based on ‘Gauss -Elimination Method’.

3. Assignment problem based on ‘Gauss –Seidel Iteration Method’.

4. Assignment problem based on ‘Newton-Raphson Method’-1D solution.

5. Assignment problem based on ‘Newton –Raphson Method’-multidimensional solution.

6.Solution of Partial Differential Equation using ‘Trapezoidal Rule’.

7. Solution of Partial Differential Equation using ‘Simposon’s Rule’.

8. Solution of Partial Differential Equation using ‘Gauss Quadrature Rule’.

9. Solution of Time Dependent Partial Differential Equation .

Text Books:

1. Balaguruswamy “ Numerical Methods” Tata Mcgraw Hill Publications
2. Dr.V.M.Domkundwar “Numerical Methods”
3. S. S. Sastry “Introductory Methods of Numerical Analysis”, Prentice Hall India

Reference Books:

1.T.J.R.Hughes"The Finite Element Method", Prentice Hall, Englewood Cliffs, NJ, 1987.

2. I.Stakgold , “Green's functions and Boundary Value Problems", Wiley, 1998.

3.D.Dahlquist and A. Bork "Numerical Methods", Dan Prentice-Hall, Englewood Cliffs, NJ,. 1974.

Syllabus for Unit Test:	
Unit Test -1	UNIT – I,II,III
Unit Test -2	UNIT – IV,V,VI

ENGINEERING MATHEMATICS-IV (OPTIONAL SUBJECT)		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	04 Credits
	Continuous Assessment: 40 Marks	

Course Pre-requisites:	
The Students should have knowledge of	
1.	Determinants
2.	Matrices
3.	Differentiation
4.	Integration of functions
5.	Differential equation
Course Objectives:	
	The course aims at making the students familiar about the most basic numerical methods and concepts like error estimation helpful in various fields of engineering and can be used to simulate the results of various numerical methods.
Course Outcomes:	
The student should be able to	
1.	derive appropriate numerical methods to solve algebraic and transcendental equations
2.	evaluate the accuracy of common numerical methods.

3.	develop appropriate numerical methods to solve a difference equation
4.	be familiar with numerical interpolation and approximation of functions , numerical integration and differentiation.
5.	be familiar with numerical solution of ordinary differential equations.
6.	To compute Numerical Solution of Partial Differential Equations.

UNIT - I	**Numerical solutions of algebraic and transcendental equations**	**(08 Hours)**
	Bisection method, Regula-Falsi method, Newton-Raphson method, Direct iterative method.	
UNIT - II	**Solution of system of linear algebraic equation**	**(08 Hours)**
	Matrix inversion method, Gauss- elimination Method, Jordan's method, Crout's method. Gauss-Seidel and Gauss Jacobi's iterative method.	
UNIT - III	**Difference equation and Solution of difference equations**	**(08 Hours)**
	Definition of difference equations, formation of difference equation. Solution of Homogeneous and non-homogeneous difference equation with constant and variable coefficients using Boole's operator method and generating functions. Simultaneous difference equation.	
UNIT - IV	**Interpolation and Numerical differentiation and integration**	**(08 Hours)**
	Finite difference operator, Interpolation formula with equal and unequal intervals. Divided differences and central differences. Curve fitting : Method of least squares. Straight line, Second degree, parabola, Exponential curve.	

	Differentiation using forward, backward and divided difference General quadrature formula, Trapezoidal rule, Simpson's 1/3rd rule, Simpson's 3/8th rule, Weddle's rule.	
UNIT - V	**Numerical solution of I order ordinary differential equation**	**(08 Hours)**
	solution by Euler's,method Euler' Modified method Taylor's series. Runga-kutta method. Milne's Predictors and Correctors method.	
UNIT - VI	**Numerical Solution of Partial Differential Equations**	**(08 Hours)**
	Classification of second order partial differential equations, Solution of Laplace's, Poisson's, heat and wave equations by finite difference methods, Use of method of characteristics for solution of initial and boundary value problems.	

Text Books:

1. Gupta P.P.& Malik G.S., *Calculus of Finite Differences and Numerical Analysis*, Krishna Prakashan Mandir,Meerut, 21/e, 2006.

2. B.S.Grewal, *Engineering Mathematics*, Khanna Publishers, 12/e, 2006.

Reference Books:

24. Francis J. Scheid, Schaum's *Outline of Numerical Analysis*, McGraw-Hill, New York, 1989.

25. S. S. Sastry, *Engineering Mathematics*, Vol I, II Prentice Hall Publication, 3/e, 2004.

26. C.Ray Wylie & Louis C. Barretle, Advanced Engineering Mathematics, Tata McGraw Hill Publishing Co Ltd., 6/e,2003.

Syllabus for Unit Test:	
Unit Test -1	UNIT – I,II,III
Unit Test -2	UNIT – IV,V,VI

42 Professional Skills Development VI

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTED:**
Theory: 4 Hours / Week	End Semester Examination: 100 Marks	4

Course Pre-requisites

The Students should have knowledge of

1.	Concepts of Maths, Logical reasoning and English Grammar taught in the last semester.
2.	A basic knowledge of Group Discussion, DO's and Don'ts done in the previous sem.
3.	Basic knowledge of writing skills, importance of professionalism in emails and letters.
4.	Knowledge on the concepts of criticism, feedback and conflicts.
5.	Awareness of the interpersonal skills like team work and introduction to Leadership taught during the last semester.
6.	Brief idea about professional and business meeting etiquettes.

Course Objectives

	The Professional Skills Development 6 is an extension of PSD- 5 with focus on the remaining topics of Aptitude and Grammar. The further complex concepts of Permutation and Combination, Probability and grammatical topics such as prepositions etc would be dealt with. The objective here is to acquaint them with the level of complexity presented in recruitment tests and also provide them techniques to solve such question with tricks/methods in a very short period. The English communication and soft skills section of PSD-6 focuses on the other important aspects of soft skills training students such as techniques of effectively handling Personal Interviews during placement process and understand the dynamics of structured Resume and PIs

Course Outcomes

The student should be able to

1.	Learn further concepts of Maths, Logical reasoning and English grammar and apply short cuts/ tricks to solve questions in less time. Learn remaining 25-30 rules of grammar topics such as prepositions, conjunctions etc relevant from the recruitment point of view.	
2.	Learn to handle vocabulary questions such as synonyms and analogies in recruitment test and other competitive exams	
3.	Understand and Learn techniques/Strategies of how to handle Personal interviews during recruitment process. Through Mock PIs students would be taught the appropriate ways of answering tricky questions in Interview and would learn the correct body language etc to be demonstrated in an interview process.	
4.	They would be acquainted with the differences between CV, Bio- Data and Resume and they would learn the correct format of a Résumé along with methods and styles to make their Resumes interesting.	
5.	Students would learn to incorporate various rules of written communication in business writing scenario with the appropriate tone and words.	
6.	Understand the importance of grooming, body language and etiquettes in the corporate sector. They would be able to conduct themselves in a professional and impressive way by conducting themselves according to situations in the professional sector.	
Unit I	**Aptitude (Maths, Logical Reasoning, English)**	**(24Hours)**
	• Maths ▪ Permutation & Combinatiom ▪ Probability ▪ Maths Revision -1 ▪ Maths Revision - 2 • Logical Reasoning ▪ Matching, Selection & Arrangement ▪ Clocks & Calendars, Visual Reasoning ▪ Input , Output & Flow Chart. ▪ Reasoning Revision- 1 ▪ Reasoning Revision-2 • English ▪ Grammar – III– (Prepositions& Conjunctions) ▪ Grammar- (Articles & Parallelism) ▪ Verbal Ability Revision- I	
Unit II	**Soft Skills & English Communication**	**(24Hours)**

	• Resume-I • Resume- II • Mock GD • Mock GD • Personal Interviews-I • Personal Interviews-II • Mock PI • Mock PI • Extempore Speeches, Group Interviews • Written Skills- Revision • Stress Management • Business Writing Tones.	
Text Books		
1. APAART: Verbal Ability		
2. APAART: Logical Reasoning		
3. APAART: Quantitative Aptitude		
4. APAART: Speak Well 1 (English Language and Communication)		
5. APAART: Speak Well 2 (Soft Skills)		