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S.No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours Per Week			Total Credits
				Theory			Practical			L	T	P	
				End. Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem.	Lab Work					
1	CE61	PEC	Professional Elective Course-II	70	20	10	-	-	100	3	1	-	4
2	CE62	OEC	Open Elective Course-I	70	20	10	-	-	100	3	1	-	4
3	CE63	PCC	Structural Analysis-II	70	20	10	30	20	150	3	-	2	4
4	CE64	PCC	Structural Design & Drawing-II (Steel)	70	20	10	30	20	150	3	-	2	4
5	CE65	PCC	Environmental Engineering-I	70	20	10	30	20	150	3	-	2	4
6	CE66	PI	Minor Project	-	-	-	60	40	100	-	-	4	2
7		MC	Industrial Training	Minimum Four weeks Duration. Evaluation will be done in 7th semester.									
			Total	350	100	50	150	100	750	15	2	10	22
8	CE67	DLC	Self-Learning Presentation (SWAYAM/NPTEL/MOOC)	-	-	-	-	-	-	-	-		8
9	CE68	MC	NSS/NCC/Swatchhata Abhiyan/Rural Outreach	Qualifier									
Additional Course for Honours or Minor Specialization				Permitted to opt for maximum 8 credits against additional MOOC courses in subject code CE67 for the award of Honours (Minor Specialization).									

Note: 01. Departmental BOS will decide list of three/four optional subjects those are available in MOOC,OEC as well for PEC.

02. MOOC/NPTEL subjects shall be taken with permission of HOD/Coordinator.

03. Industrial training should be apart from laboratory work unertaken in the college rather it should have industrial orientation and practical aspects/field work. Report to be sbmitted at the beginning of 7th semester and students have to give a presentation in the Department. Evaluation will be done in 7th semester.

Professional Elective Course-II		
S.No.	Subject Code	Subject Name
1	CE61A	Geographical Information System
2	CE61B	Natural Disaster Mitigation and Management
3	CE61C	Pre-Stressed Concrete Structure Design

Open Elective Course-I		
S.No.	Subject Code	Subject Name
1	CE62A	Advanced Water Resource Engineering
2	CE62B	Waste Management
3	CE62C	Elements of FEM

1 hour lecture (L) = 1 credit   1 hour Tutorial (T) = 1 credit   2 hour Practical (P) = 1 credit

PEC: Professional Elective Course, OEC: Open Elective Course, PCC: Professional Core Course, PI: Project and Internship, DLC: Distance Learning Course, MC: Mandatory Course

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Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
		Theory			Practical						
CE-61A	Geographical Information System	End Sem	Mid-sem Exam	Quiz/ Assignment	End sem	Lab work	100	L	T	P	4
		70	20	10	-	-		3	1	-	

MODULE I:

Definition of GIS, maps & GIS, digital representation of geographic data, data quality and data standards, raster and vector based data processing, digital terrain modeling, spatial analysis and modeling. remote sensing, its terminology, electro magnetic signal, atmospheric window. active and passive systems for remote sensing, remote sensing applications.

MODULE II:

Principle of aerial photograph, flight planning, relief displacement of vertical photographs. stereoscope, parallax bar, methods of aerial photo visual interpretation keys by this instrument.

MODULE III:

Principle of satellite image procurement, spectral reflectance curves, spatial, spectral, temporal. radiometric resolution characteristics of images, errors of satellite images & their rectification. methods of visual interpretation of satellite images.
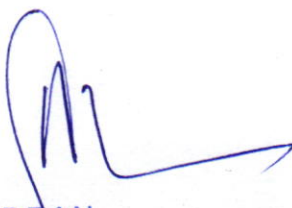
MODULE IV:

Projection, different types of projections and applications in image correction, projection used in India, measure of shortest distance between two points on the earth.

MODULE V:

Remote sensing, technique used in resource management (soil, water,) & database management system (urban & rural planning) for civil engineering projects, global positioning system.

Reference Books:

1. Concept and Principle of Geographical Information system by: W.Yeung
2. Principle of Remote Sensing by Sabins
3. Manual of Remote Sensing by (A.S.R.S.) USA.

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Department of Civil Engineering,
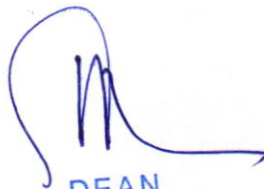Government Engineering College
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Course Outcomes-

After the completion of this course student will be able to-

CO1	Process GIS raster and vector data for further spatial analysis and modeling.
CO2	Compute measurements of various ground features through mathematical computations of aerial photograph.
CO3	Perform visual interpretation of satellite images in terms of different resolutions studied.
CO4	Apply different projection systems for image correction and calculation of shortest distance.
CO5	Illustrate remote sensing and GPS techniques for resource collection and database management.

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COURSE CONTENTS   **w.e.f. July 2023**

Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
	Natural Disaster Mitigation and Management	Theory			Practical						
CE-61B		End Sem	Mid-sem Exam	Quiz/ Assignment	End sem	Lab work	100	L	T	P	4
		70	20	10	-	-		3	1	-	

MODULE I

Natural Disasters Overview introduction, natural disasters around the world, natural disaster risk assessment, earth and its characteristics.

MODULE II

Enviromental change and its degradation. climate change, global warming.

MODULE III

Plate tectonics & earthquakes: introduction and review natural disasters, principles, elements, and systems, geological, geo- morphological aspects, earthquake, geology, seismology, characteristics and dimensions. landslides.

MODULE IV

Critical climate system aspects and processes: oceanic, atmospheric and hydrologic cycles.

MODULE V

Mapping modeling risk analysis and loss estimation, natural disaster risk analysis prevention and mitigation, applications of space technology, education and training, establishment of capacity building and along various stakeholders government education institute, use of multimedia, etc.

Reference Books

1. Edward A Keller Robert Natural Hazards, pearson
2. Didas Natural Diasater. Dicrax Education

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Course Outcomes-

After the completion of this course student will be able to-

CO1	Summarize the causes of natural disaster and its preventive measures.
CO2	Explain principles, elements and characteristics of natural disasters
CO3	Summarize critical climatic systems.
CO4	Categorize different modelling methods for natural hazards assessment.
CO5	Explain administrative mechanism for disaster mitigation.

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Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
		Theory			Practical						
CE-61C	Pre-stressed Concrete Structure Design	End Sem	Mid-sem Exam	Quiz/ Assignment	End sem	Lab work	100	L	T	P	4
		70	20	10	-	-		3	1	-	

MODULE-I

Pre-stressing Systems and losses of pre-stressing, introduction various systems of pre- stressing. Types of loss and their analysis. Working Stress Design of Simple Beams: Critical load conditions allowable stresses, flexural design criteria axially pre-stressed members design of pre-stressing cable for a given cress section, design procedure based on flexure, design by load balancing method and multiple stage pre-stressing.

MODULE-II

Continuous Beams: Analysis of two span beam analysis of two span beam with eccentricities at outer supports, continuous beams with variable section design of continuous beam. Miscellaneous Structural Members: Columns subjected to combined bending and axial force, piles, poles, piers and abutments, Tension members, ring beams circular tanks and pipes pavement sleepers roads and runways.

MODULE-III:

Limit State Design of Beams: Limit state of strength in flexure, shear and torsion permissible stresses limit state of serviceability against deflection. Cracking and durability, design of simply supported and continuous beams.

MODULE-IV

Bond and Anchorage of Pre-stressing cables Bond in pre tensioned and post tensioned construction, prestressing cable at centroid axis symmetric multiple cables causing axial thrust cable with eccentricity,inclined pre-stressing cable spanning stress, end zone reinforcement

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MODULE-V

Pre-stressed Concrete Slabs: One way slab two way slabs, pre-stressed concrete beam slab construction, pre-stressed flat slab.

Deflection and Crack Width: Factors influencing deflection, short term deflections of un cracked members, long term deflection deflections of cracked members. Estimation of crack width using British code and FIP recommendations.

Reference Books:

1. N.Krishna Raju, Pre-stressed Concrete, Tata Mc Graw Hill Book Co.
2. P. Dayaratran, Pre-stressed Concrete Structures, Oxford & IBH Co. Delhi.
3. Jain& Jai Krishna, Plain & Reinforced Concrete Vol - II Nemchand& Bros Roorkee.
4. IS 1343-980 code of Practice for Pre-stressed Concrete Bureau of India Standards New Delhi.

Course Outcomes-

After the completion of this course student will be able to-

CO1	Explain different types of pre-stressing systems.
CO2	Analyze different types of prestressed concrete structural members.
CO3	Design pre-stressed concrete simple & continuous beam, slab, column and miscellaneous structural members.
CO4	Calculate pre-stressing losses, short term, long term deflection and crack width.

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Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/ Week			Total Credits
		Theory			Practical						
CE-62A	Advance Water Resource Engineering	End Sem	Mid-sem Exam	Quiz/ Assignment	End sem	Lab work	100	L	T	P	4
		70	20	10	-	-		3	1	-	

Module -I
Gravity dams: Design Criteria, forces acting on gravity dams, elementary profile, low and high gravity dams, stability analysis, evaluation of profile by method of zoning, practical profile, foundation treatment, construction joints, galleries in gravity dams.

Module - II
Earth and Rock fill dams: Earth Dams : Types, causes of failure and design criteria, soils suitable for earth dam construction, construction methods, foundation requirements, typical earth dam sections, estimation of seepage through and below the dam, seepage control, stability of slopes by slip circle method of analysis, pore pressures, sudden draw down, steady seepage and construction pore pressure condition.

Module - III
Spillways: Various Types of Spillways, Ogee spillway and its design details of
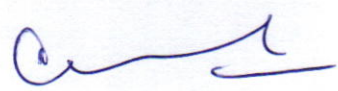Siphon shaft, chute and side channel spillways, emergency spillways.

Module - IV
Energy dissipation and gates: Principles of energy dissipation, Energy dissipaters
based on tail water rating curve and jump height curves spillway crest gates - vertical lift and radial gates, their design principles and details. Design of canal regulating structures, detailed design of sarda type canal fall. Types of cross drainage works - Aqueduct siphon aqueduct, super passage, level crossing &inlet & outlets.

Module - V
Hydropower Plants: Introduction of Hydropower development, assessment of

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power potential, types of hydropower plants, general features of hydro-electric schemes, selection of turbines, draft fubes, surge tanks, penstocks, power house dimensions, development of micro hydel stations, tidal plants, pumped storage plants and their details.

Reference Books:
1. Engineering for Dams (Volumes I,II&ID by Creager. Justin & Hinds
2. Hydroelectric Hand Book by Creager

Course Outcomes-

After the completion of this course student will be able to-

CO1	Calculate the forces acting on gravity dam and stability analysis of hydraulic
CO2	Determine the rate of seepage using flow-net
CO3	Design various types of spillways, energy dissipaters and canal regulating structures.
CO4	Explain the functioning & elements of hydropower plants.

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Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
		Theory			Practical						
CE-62B	Waste Management	End Sem	Mid-sem Exam	Quiz/ Assignment	End sem	Lab work	100	L	T	P	4
		70	20	10	-	-		3	1	-	

MODULE I

Municipal solid waste (management and handling) rules, hazardous waste (management and handling) rules; biomedical waste handling rules, fly ash rules; recycled plastics usage rules; batteries (management and handling) rules.

MODULE II

Municipal solid waste managements-fundamentals sources; composition; generation rates; collection of waste; separation, transfer and transport of waste; treatment and disposal options.

MODULE III

Hazardous waste management fundamentals characterization of waste, compatibility and flammability of chemicals; fate and transport of chemicals, health effects.

MODULE IV

Radioactive waste management fundamentals sources, measures and health effects; nuclear power plants and fuel production; waste generation from nuclear power plants, disposal option.

MODULE V

Exposure pathway of pollutants emitted from recycling of e-waste, e-waste management rules of India (2011 and 2016 rules) e-waste management: case studies and unique initiatives from around the world.

References

1. Pichtel, John. Waste Management Practices: Municipal, Hazardous and Industrial. CRC Press, Taylor and Francis Group, 2005.

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2. LaGrega, Michael D., Buckingham, Philip L and Evans, Jeffrey C. Hazardous Waste Management

3. Waveland Press Inc., Reissue Edition, 2010. 3. Warta, Richard 1. Hazardous Wastes - Sources, Pathways, Receptors, Wiley (1) Edition), 1998
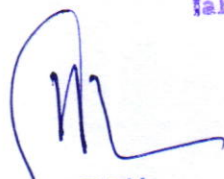
Course Outcomes-

After the completion of this course student will be able to-

CO1	Classify solid waste by its physical, biological and chemical characteristics.
CO2	Apply proper methods of collection and conveyance to reduce solid waste.
CO3	Predict impact on socio economic environment.

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Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
		Theory			Practical						
CE-62C	ELEMENTS OF FEM	End Sem	Mid-sem Exam	Quiz/ Assignment	End sem	Lab work	100	L	T	P	4
		70	20	10	-	-		3	1	-	

MODULE I:

Calculus of variation, introduction to calculus of variations, introduction to equilibrium equations in elasticity, Euler's Lagrange's equations, principal of virtual work, virtual displacements, principle of minimum potential energy, boundary value, initial value problems, flexibility approach, displacement approach, different problems in structural analysis.
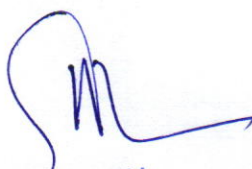
MODULE II:

FEM procedure, derivation of FEM equations by variation principle polynomials, concept of shape functions, derivation for linear simplex element, need for integral forms, interpolation polynomials in global and local coordinates weighted residual methods: concept of weighted residual method. derivation of FEM equation by Galerkin's method, Solving cantilever beam problem by Galerkin's approach, introduction of shape functions for CST triangular elements, rectangular elements, quadrilateral elements

MODULE III:

Concept of iso-parametric elements, concept of Jacobin matrix. numerical integration: numerical integration, one point formula and two point formula for 2D formula, different problems of numerical integration evaluation of element stiffness matrix.

MODULE IV:

Pascal's triangle law for 3D shape function polynomials, shape function for beam elements, convergence: convergence criteria, compatibility requirements, characteristics of stiffness matrix, direct method for deriving shape functions using Langrage's formula, plane stress problems.

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MODULE V:

Analysis of structures: truas elements, analysis of truss problems by direct stiffness method analysis of frames and different problems, different axi-symmetric truss problems,

Reference Books:

1. The Finite Element method-ZIENKIEWICZ.O.C.Tata McGraw Hill Pub, New Delhi, 2000
2. Finite Element Methods by CR Alaval, PHI
3. Finite element method with application in engineering by Chandrupatia&Belegundu. Pearson Publication.
4. Concepts and Applications of Finite Element Analysis: COOK. D. Robert, Malus S. David, Plesha E Michel, John wilely& sons 3rd Edn. New York, 2000
5. Finite Element Analysis -CS, Krishnanmoorthy, Tata McGraw Hill Publishing Co, Ltd, New Delhi
6. Introduction to the Finite Element method Desai ABEL CBS Publishers & Distributors New Delhi

Course Outcomes-

After the completion of this course student will be able to-

CO1	Interpret the philosophy behind principles, design and modeling considerations in using finite element analysis.
CO2	Develop stiffness matrices for spring, truss, beam, plane stress problems and three dimensional problems using the concept of direct equilibrium and potential energy methods.
CO3	Develop the finite element formulations for heat transfer problems.
CO4	Evaluating the convergence of solutions using finite element analysis and assess the accuracy of simulated results.
CO5	Be proficient in the use of commercial finite element software.

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Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
		Theory			Practical						
CE-63	Structural Analysis - II	End Sem	Mid-sem Exam	Quiz/ Assignment	End sem	Lab work	150	L	T	P	4
		70	20	10	30	20		3	-	2	

Module - I:

Moment distribution method in analysis of frames with sway, analysis of box frames, analysis of portals with inclined members, analysis of beams and frames by Kani's method.

Module - II:

Plastic analysis of beams and frames.

Module - III:

Analysis of tall frames, wind and earthquake loads, codal provisions for lateral loads. Approximate analysis of multistory frames for vertical and lateral loads.

Module - IV:

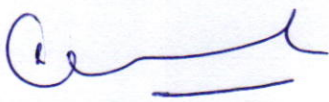Matrix method of structural analysis: force method and displacement method.

Module - V:

Influence lines for indeterminate structures, Muller Breslau principle, Analysis of Beam-Columns.

Books Reference:

1. Wang C.K. Intermediate Structural Analysis McGraw Hill New York
2. Kinney Streling J. Indeterminate structural Analysis. Addison Wesley.
3. Reddy C.S. Basic Structural Analysis, Tata Mc Graw Hill Pub. Co. New Delhi
4. Norris C.H. Wilbur J.B. and Utkys Elementary Structural Analysis, MC Graw Hill International Tokyo
5. Weaver W & Gere JM, Matrix Methods of Framed Structures, CBS Pub.& Dis. Delhi

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STRUCTURAL ANALYSIS - II LAB

List of Experiments:

1. Verify theorem of Reciprocal deflection of Maxwell reciprocal theorem using simply supported & cantilever beam.

2. Verify principle of superposition for deflection using simply supported & cantilever beam.

3. Draw influence line diagram for bending moment at a section of SSB using bending moment apparatus.

4. Obtain horizontal thrust at support of a semicircular two hinged arch and to draw ILD for this horizontal thrust;alsoto compare experimental results with analytical solutions.

5. Obtain force in members of a shear leg apparatus and to compare results with analytical method.

6. Obtain deflection at free end of curved member consists of a quadrant with straight edge and to compare results withthose obtained by analytical method.

7. Obtain elastic deflection at free end of a semicircular frame with straight edge.

8. Obtain ILD for intermediate reaction of a cantilever beam of two unequal span using Muller Breslau's principle tocompareresultswith those obtained by analytical method.

Course Outcomes-

After the completion of this course student will be able to-

CO1	Analyze portal frames with sway and frames with inclined members.
CO2	Calculate plastic moment capacity and collapse load for beams and frames subjected to different loading conditions.
CO3	Analysis of tall frames/multistory buildings by approximate methods
CO4	Analyze the beams and frames using matrix method of analysis.
CO5	Draw ILD for support reaction, SF & BM at various sections for indeterminate structures.

After the completion of this lab student will be able to-

CO1	Verify Max-well's reciprocal theorem
CO2	Perform experiments to determine horizontal reaction for two and three hinged arch
CO3	Perform experiments to determine deflection and slope of beams and frames for various loading conditions.

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Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
		Theory			Practical						
CE-64	Structural Design and Drawing – II (Steel)	End Sem	Mid-sem Exam	Quiz/ Assignment	End sem	Lab work	150	L	T	P	4
		70	20	10	30	20		3	-	2	

Module-I:
Various loads and mechanism of the load transfer, partial load factors structural properties of steel, Design of structural connections-Bolted, Rivetted and Welded connections.

Module - II:
Design of compression members, Tension members, Roof Trusses - Angular & Tubular, Lattice Girders.

Module - III:
Design of Simple beams Built-up beams, plate girders and gantry girders.

Module - IV:
Effective length of columns, Design of columns- simple and compound, Lacings and battens. Design of footings for steel structures, Grillage foundation.
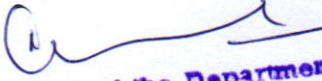
Module-V:
Design of industrial building frames, multi-storey frames, Bracings for high rise structures. Design of transmission towers.

NOTE :

All the Designs for strength and serviceability should strictly be as per the latest version of IS:800.

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Books Reference:
1. Design of Steel Structures by Subramanium
2. Design of Steel Structures by Duggle
3. Design of Steel Structures by BhaviKatti

STRUCTT'RAL DESIGN & DRAWING.II (STEEL) LAB

List of Experiments:
1. Design & drawing of structural connection.
2. Design & drawing of members of roof trusses.
3. Design & drawing of beams & Plate Girders.
4. Design & drawing of build up Columns.
5. Design & drawing of Footing.
6. Draw the layout of different types of Rivet connections.
7. Draw the neat sketch of staggered joints and show pitch ,gauge and edge distance.
8. Draw the plan and elevation of Grillage foundation.
9. Draw the plan and elevation of slab base.
10. Draw the plan and elevation of Gusset base

Course Outcomes-
After the completion of this course student will be able to-

CO1	Identify various loads, mechanism of load transfer and design of structural connections for Steel.
CO2	Design truss members, girder, other structural member-for-steel buildings and transmission tower
CO3	Explain different types of building frames and bracing systems
CO4	Apply effective length of column, lacing and battens

After the completion of this lab student will be able to-

CO1	Identify the major steps and symbol used in civil engineering drawings
CO2	Draw civil engineering drawing for different connections used in steel structures
CO3	Draw civil engineering drawing for different structural elements for steel

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Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
		Theory			Practical						
CE-65	Environmental Engg - I	End Sem	Mid-sem Exam	Quiz/ Assignment	End sem	Lab work	150	L	T	P	4
		70	20	10	30	20		3	-	2	

Module - I:

Estimation of Ground and surface water resources, quality of water from different sources, demand & quantity of water, fire demand, water requirement for various uses, fluctuations in demand, forecast of population.

Module - II:

Impurities of water and their significance, water-borne diseases, physical, chemical and bacteriological analysis ofwater, water standards for different uses. Intake structure, conveyance of water, pipe materials, pumps operation &pumping stations.

Module - III:

Water Treatment methods theory and design of sedimentation, coagulation, filtration, disinfection, aeration & water softening, modern trends in sedimentation & filtration, miscellaneous methods of treatment.
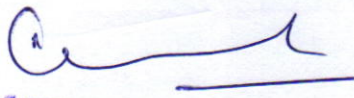
Module - IV:

Layout and hydraulic Design of different distribution systems, pipe fittings, valves and appurtenances, analysis of distribution system. Hardy cross method, leak detection, maintenance of distribution systems, service reservoir capacity and height of reservoir.

Module - V:

Rural water supply schemes, financing and management of water supply project, water pollution control act,conservancy& water carriage system, sanitary appliance and their operation, building drainage system of plumbing.

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Books Reference:

1. Water Supply & Sanitary Engg. By G.S. Birdi-Laxmi publications (p) Ltd. New Delhi
2. Water & Waste Water Technology by Mark J.Hammer Prentice - Hall of India, New Delhi.
3. Environmental Engineering - H.S. Paeavy& D.R. Rowe Mc Graw Hill Book Co. New Delhi
4. Water & Waste Water Technology G.M. Fair & J.C. Geyer.

ENVIRONMENTAL ENGINEERING - I LAB

List of Experiments:

1. To study the various standards for water
2. To study of sampling techniques for water
3. Measurement of turbidity
4. To determine the coagulant dose required to treat the given turbid water sample
5. To determine the conc. of chlorides in a given water samples.
6. Determination of hardness of the given sample.
7. Determination of residual chlorine by chloroscope.
8. Determination of Alkalinity in a water samples
9. Determination of Acidity in a water samples
10. Determination of Dissolved oxygen in the water sample.

Course Outcomes-

After the completion of this course student will be able to-

CO1	Compare the quality of raw water from various resources and calculate water demand based on population forecast.
CO2	Explain physical, chemical and biological drinking water standards.
CO3	Design Water treatment units for treatment of raw water
CO4	Design Water distribution system including hydraulic layout, leak detection and maintenance.
CO5	Explain water pollution control act and operation of sanitary appliance

After the completion of this lab student will be able to-

CO1	Examine quality of raw water from various resources.
CO2	Analyze physical, chemical and biological drinking water standards

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